MARCH 1949

# Plant Engineering

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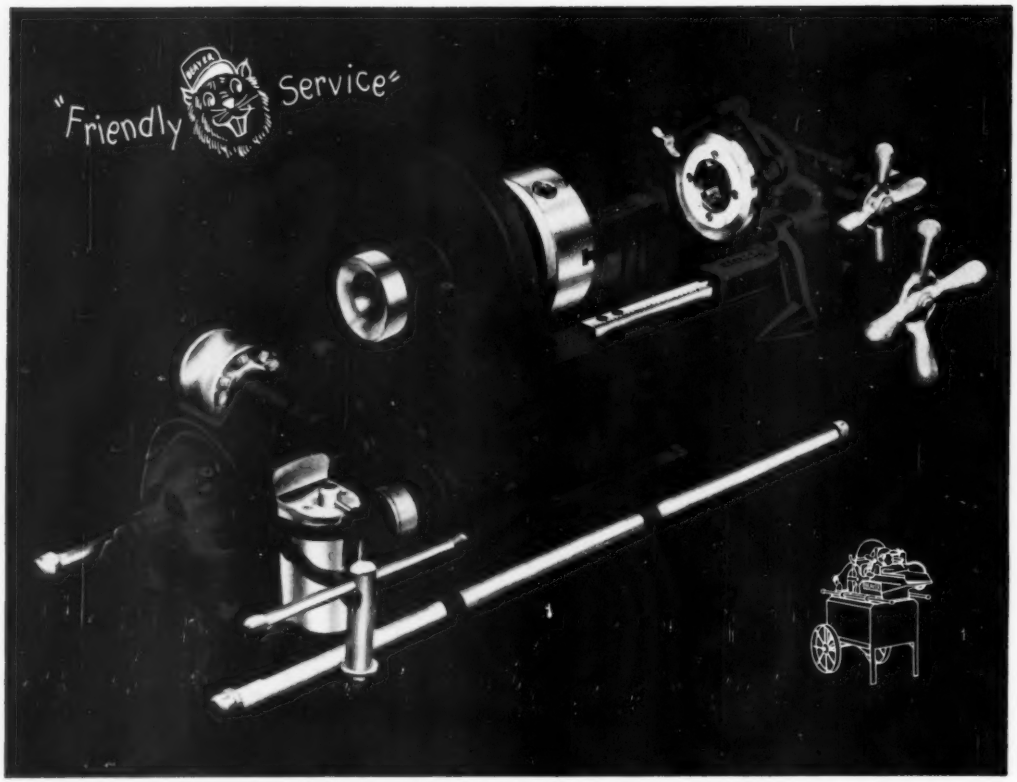
Volume 3, No. 3

The magazine that helps plant engineers with their everyday problems




# Two new improvements added to the BEAVER MODEL-A Pipe and Bolt Machine

Many improvements have been made in the Beaver Model-A Pipe & Bolt Machine since it was first introduced 14 years ago. Now, two more improved features are added—both protected by patents pending.

**First**—an Automatic Switch Lock which makes it impossible to start the machine unless the chuck wrench is in its holder. This protects the workman against injury and the machine against damage.

**Second**—an Eccentric Spool Pipe Rest (independent from the revolving spindle) which absorbs the "whip" of long lengths of rotating pipe and prevents excessive wear on the spindle bearings. More important still, it eliminates "flat-sided" threads, which leak, caused by spindle rock.

## MODEL-A FEATURES

Cuts and threads pipe, 1/8 to 2-inch . . . With driveshaft and geared tools the range is increased to 2-1/2 to 12-inch pipe . . . Cuts off bolts 1/4 to 3/4-inch . . . Threads bolts 1/4 to 2-inch . . . 186 different kinds and sizes of dies available from stock . . . Choice of motors, 110, 220, 440 or special voltages . . . Choice of wheel or knife cutoff, both patented . . . Gear driven, with gears running in oil . . . Visual oil level gauge . . . Right-hand operation like a lathe . . . Accessible oil pump for easy cleaning . . . Quick-opening, fully adjustable dieheads . . . Backed by 49 years of experience and a world-wide reputation for high quality, good performance and friendly service to users.

**BEAVER PIPE TOOLS**

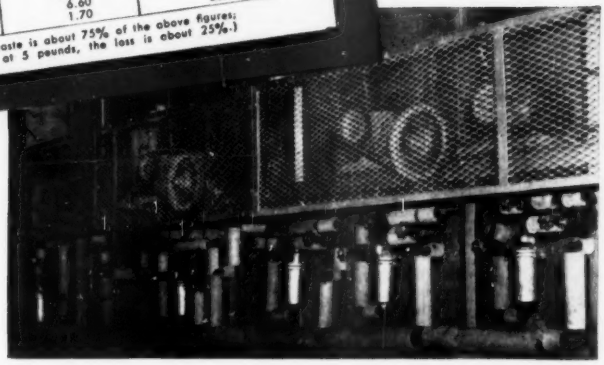
**210-300 DANA AVE. WARREN, OHIO, U. S. A.**

# SMALL STEAM LEAKS add up!

**Showing cost of various sized steam leaks at 100 pound pressure. (Assuming steam costs 50 cents per 1000 lbs.)**

| Size of Orifice | Lb. Steam Wasted Per Month | Total Cost Per Month | Total Cost Per Year |
|---|---|---|---|
| 1/2" | 835,000 | $417.50 | $5,010.00 |
| 3/8" | 470,000 | 235.00 | 2,820.00 |
| 1/4" | 210,000 | 105.00 | 1,260.00 |
| 1/8" | 52,500 | 26.25 | 315.00 |
| 1/16" | 13,200 | 6.60 | 79.20 |
| 1/32" | 3,400 | 1.70 | 20.40 |

(For steam at 50 pounds pressure, the waste is about 75% of the above figures; at 20 pounds, it is about 50%; and at 5 pounds, the loss is about 25%.)

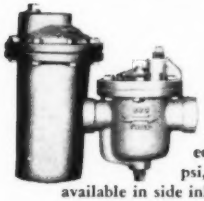


## TYPICAL FUEL SAVINGS SECURED WITH ARMSTRONG TRAPS

**20% FUEL SAVINGS** after trapping all heating coils individually. — Norton Greenhouses, St. Paul, Minn.

**33-1/3% REDUCTION IN ANNUAL COAL BILL** after installing Armstrong traps on cooking vats. — Ralph L. Smith Lumber Co., North Kansas City, Mo.

**3,728 GALLONS OF FUEL OIL SAVED** in one year after replacing old traps with Armstrongs on kettles, low pressure heating system and cream beaters. — Mary Lincoln Candies, Buffalo, N. Y.



## STEAM SAVERS:

For trapping heating systems and process equipment from 1 to 250 psi, Armstrong Traps are available in side inlet—side outlet or bottom inlet—top outlet body styles. These compact, dependable traps provide more actual hot condensate capacity per dollar of trap investment than any other traps on the market. For selection data, capacities and prices SEND FOR the 36-page ARMSTRONG STEAM TRAP BOOK.

## CHECK YOUR STEAM TRAPS *now!*

The chart above shows that a "little" steam leak can cost a lot—and a hundred or a thousand little leaks cost a lot more! No plant can afford the luxury of leaky steam traps. It costs far more to keep them than it does to replace them with modern Armstrong Inverted Bucket Steam Traps. Armstrong Traps won't leak steam because:

1. The valve and seat are ground and lapped to a precision, steam-tight fit.
2. The valve is water-sealed at all times.
3. Both the valve and seat are made of chrome steel, heat treated for long life and corrosion and erosion resistance.

With today's high fuel and operating costs Armstrong traps are priced lower in proportion to the savings they can effect than at any time in their history. Let your nearby Armstrong Representative help you select the traps you need or write direct to the factory.

**ARMSTRONG MACHINE WORKS**
912 MAPLE ST., THREE RIVERS, MICH.

**ARMSTRONG *Inverted Bucket* STEAM TRAPS**

*Factory Representatives in 48 Key Cities... Traps Stocked at 147 Points*

**PLANT ENGINEERING**

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George L. Wright, Jr.
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Terminal Sales Bldg.
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# 'Round About with the Editors

## Plan Plantwise—not Haphazardly

CERTAIN PHASES of the material handling picture were covered comprehensively in the January issue. It would, however, have been desirable to expand a bit on the subject, touched upon very briefly in the first article, that is, plan plantwise—not haphazardly.

This of course, is not always practical, although it is desirable to carry it as far as possible in any given circumstance. An ideal line of attack might be laid out upon our own experience. By incorporating some features from other installations this might be outlined as follows.

"Materials handling in our plant has not been intentionally neglected over the years but with the low labor costs prior to the war it was seldom a matter of prime concern. During the war it was of course, a matter of expediency. We used what we could get delivery on and conversely in most cases we got what we asked for the output.

"After the war, business conditions were in general, good. In the plant however, costs were erratic and spotty because high labor costs threw some departments out of line. With the postwar rearrangement, we had considerable equipment which was no longer used. We were able to get one foreman with particularly high costs interested. We were able to rearrange his department with odds and ends and without purchasing new equipment. The improvement in performance was material.

"With this success, we are able to rearrange another department. Although this required the purchase of some new equipment, it did eliminate a proposed plant expansion of some 5000 sq ft. The Plant Manager was interested but skeptical. These two examples pretty well convinced him. With this support, we were able to get a hearing at the weekly foreman's meeting. By the judicious selection of movies, we built up not only an acceptance but an avid interest in the subject.

"This interest produced many suggestions, some practical, some impractical. However, with the active support of all supervision, the idea of a complete plant wide survey was not difficult to put across. The survey was good, although we did not agree with it entirely. It was modified and remodified. The survey was the basis of what you might call a master plan. Plantwise, it has been sectionalized. We know where money can be spent to best advantage as it becomes available. Furthermore, if and when completed the various sections will fit together.

"We do not expect that the plan will ever be completed, for changing conditions in the plant and equipment obsolescence will necessitate modifications. In the meantime, however, three departments have been changed and a fourth is under way. The scheme is paying for itself. Furthermore, it is used to maximum advantage, for each foreman has had a part in the planning.

"From our standpoint, our department master-minded the whole thing and sold the idea. Publicly, however, we take little credit. We say all we did was show some movies and work out some minor details of other people's ideas. Whether this was the right approach or not, depends on personal opinion and company policy. If sufficient money is involved, new ideas can be rammed down people's throats. We prefer to work the other way and sell the idea in such a way that everyone has a part in the planning. This is not always possible, but where it can be done, it does pay off well in better cooperation and better utilization. After all, the best equipment in the world is no good unless it is used by those whom it was intended to serve."

Chicago, Ill. M.H.R.

JUST A WORD to congratulate you on your January issue of "Plant Engineering" which I have gone over quite carefully in view of my interest in the Material Handling Show this month in Philadelphia and activity in connection with the A.S.M.E. program.

I was glad to see an article referring to Sales Engineering by Mr. John F. Roberts. After all, the big problem ahead is not production—but distribution—or putting the machine to work. Cost production, to which you devoted so much space, is of course a great aid to making products more cheaply. Your magazine is developing into a position where I think it is of real service to industry.

New York, N. Y. BERNARD LESTER

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# Cut V-belt costs 20 to 50% with new B. F. Goodrich grommet V-belt

## *Lasts longer, stands shock loads better, costs no more*

A NEW patented construction by B. F. Goodrich puts all the cord material in a V-belt to work in the form of twin, endless, extra-flexible grommets — *not* cables — placed close to the driving faces of the belt (see left, above). No "lazy" cords in the interior to shirk their share of the load. Because grommets are endless they are more flexible, with no stiff section such as occurs in an ordinary cable, with spliced or overlapped ends.

***Why twin grommet construction?*** When an ordinary large-sized V-belt (right, above) goes into the sheave its sides are squeezed by the pulley, forcing the center cords downward and out of the line of load-carrying stress. Belt men call this "dishing", because the cord section becomes concave, like a dish. With twin grommet construction there are no center cords, no "dishing" — as the belt goes into the pulley the grommets remain on the job, close to the driving surfaces of the belt.

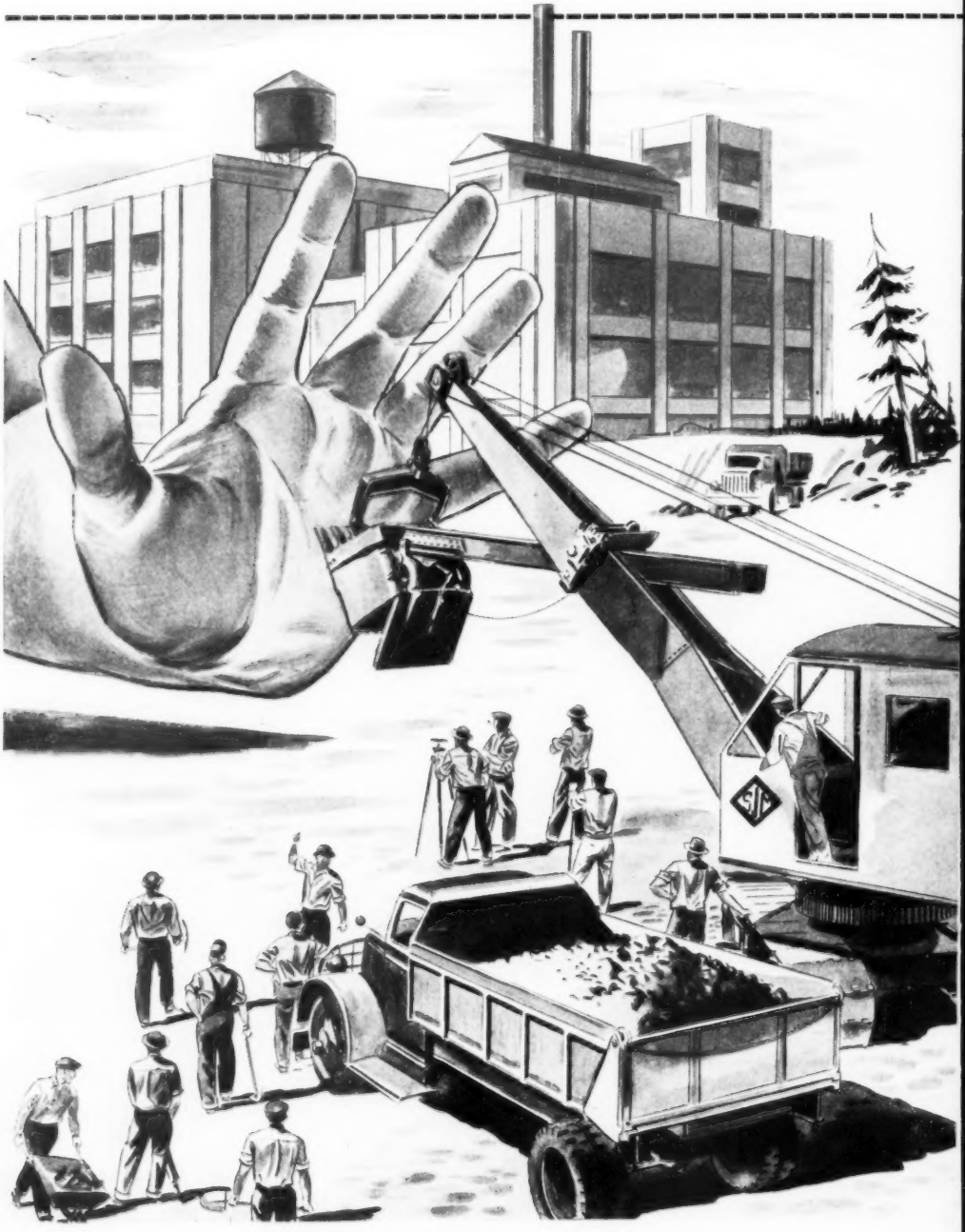
***Grommet belts take shock load better, last longer*** — Laboratory and field tests show that grommet belts have a higher safety factor, greater ability to withstand shock load, than ordinary V-belts. Reasons: no "lost" or "lazy" cords to shirk, greater flexibility, better gripping power. Grommet belts tested lasted from 20 to 50% longer than ordinary V-belts. Reasons: no cord overlaps (85% of ordinary V-belts fail in the overlapped section), no sawing cords, less heat.

***How to get genuine grommet V-belts*** — Twin grommet construction is an exclusive, patented B. F. Goodrich development — no other manufacturer can make grommet V-belts. Now available in "D" and "E" sections. To be sure you get genuine grommet V-belts see your B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

**B.F.Goodrich**
**RUBBER FOR INDUSTRY**

YOU CAN BE **SURE**.. IF IT'S

# Westinghouse



# STOP!

## ...have you planned your power distribution system?

Building a new production area? Everything laid out to do the job you've planned? Sure it is.

BUT . . . have you planned for the *best system* to power your new production lines? Their ability to produce depends directly on this power system.

Will your distribution system save you money *over a period of years?* Have you thought about *future* loads? Is it flexible enough to handle shifting production lines? Will it provide voltage regulation you need?

Whatever the problem—Westinghouse can help you find the "one best" system for *your* plant.

Our engineers have worked with *all types* of industries for a good many years. They have found new and better answers to *all* phases of power distribution. Westinghouse offers this co-operation to all Industry in getting power to do the best job at the lowest possible cost. J-94788

### Here's REAL help for your "System Planning"

**1. A new 34-page booklet:** "Industrial Plant Distribution Systems", B-4045. Fact-filled pages and colorful diagrams present the basic systems most widely used in Industry today. Find how to choose the *best system* for *your* plant.

**2. System Selector:** A wealth of information condensed to a pocket-size selector! In a matter of minutes you can make preliminary decisions on the system that answers *your* requirements.

**3. Color Movie:** Get all the facts visually! This 16-mm, full-color movie is a 20-minute dramatization that will point the way to new economies in plant power distribution. Ask one of our representatives for a free showing of "The Right Power Distribution System". No obligation, of course.

*If you're expanding or building a new production area . . . get this invaluable information NOW!*

Call your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

Westinghouse

SYSTEM PLANNING SERVICE

# Plant Engineer's Digest

## Meter Repair Costs Cut

THE AVERAGE cost for a meter repair at the factory was running about $3.50 per meter. The idea proposed by a group in the Malden and Melrose Gas Company's Meter Department, cut this cost on a considerable percentage of the meters to approximately $1 per meter by making a simple shop repair.

The principal reason for meter errors is the effect which the gas has on the gas meter diaphragm. The gas has a solvent action which tends to remove the oil dressing from the leather making the diaphragms stiff and thereby introducing inaccuracies into meter registration. The basic idea proposed was to replace the oil dressing without opening up the meter.

Briefly, the procedure is this: Two holes are punched in the meter case, one on each side of the center partition. The meter is drained and then immersed in warm oil, at a temperature of approximately 120 F. It is essential that a thermostatic control be installed since the oil temperature must never be allowed to approach its flash point of 355 F. The meter is soaked in this bath for approximately three-quarters of an hour, after which it is removed and again drained. The holes are soldered up and the meter is allowed to stand in the shop for a week before testing. More than 75 per cent of the meters so treated are brought back into correct proof without further adjustment. Naturally, all meters cannot be reoiled in this way. Meters with errors larger than 5 per cent or meters with diaphragms which because of their age need replacement are still sent to the factory for repair.—*From the October issue of Contact, a publication of the New England Electric System, 441 Stuart Street, Boston, Mass.*

## Pulsating Conveyor Chains

IN SOME conveyor installations it is possible to note a pulsating chain movement instead of a continuous movement. In existing units, unfortunately, very little can be done to remedy this condition. The pulsating motion of chain is found most commonly on slow moving conveyors of greater than average length. The reason for this pulsation may lie in the fact that the head or driving sprocket has a polygonal profile. This actually produces intermittent acceleration and deceleration of the chain. At higher speeds, such as 20 fpm or more this is not noticeable, but at lower speeds it is aggravated by the tendency of the chain to stretch during acceleration while slackening off during deceleration.

The most effective method of avoiding pulsation is to use a 10 or 12 tooth head sprocket. Small sprockets are usually the largest contributing factor to this condition. The drive chain should also be checked. Sometimes, with large pitch drive chains, the number of teeth in its sprockets and the drive sprockets happen to possess common factors that produce harmonic pulsations. Any pinching or retarding of the chain tends to increase pulsation. Therefore, the path and tracks of the conveyor should also be checked for obstructions. *From News-veyor, a publication of Mechanical Handling Systems, Inc., Detroit, Mich.*

## Piping of Hot, Viscous Fluids

IN A WIDE VARIETY of industrial processes today, the batch handling of hot viscous fluids has been replaced by more convenient methods of pipeline transportation. The problem in all instances where viscous fluids are pipe-conveyed is to maintain the pipeline at a high enough temperature to prevent solidification of the fluid. There are four conventional methods of maintaining pipeline temperatures for hot viscous fluids. Electrically charged pipelines as shown in Fig. 1, are used for the transportation of such heavy fluids as asphalt, resin, grease, wax or

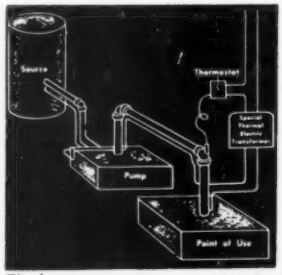



Fig. 1

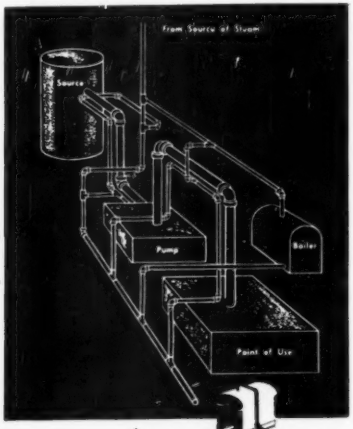
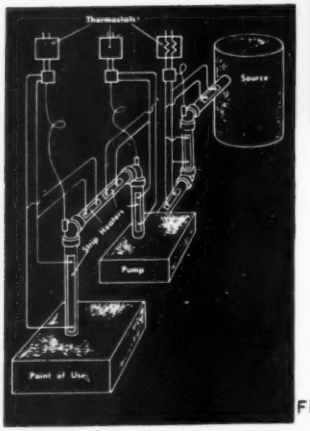



Fig. 3



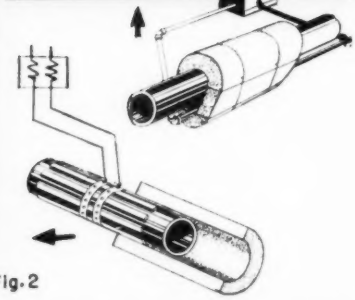
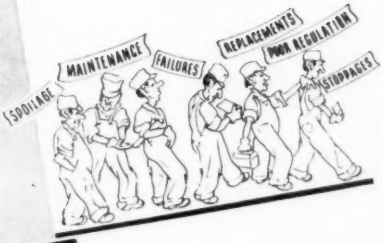



Fig. 2

**Fig. 1. On low voltage, electrified viscous pipelines, insulation should be notched at each point where electrical connections are made. Fig. 2. Strip heaters, clamped at intervals along a pipe run, are most commonly used where heat is applied in local applications—on pumps, valves, and other process equipment. Fig. 3. Relatively simple to install, steam traced lines function with very little expense. Steam tracers are common but are limited to small pipelines**

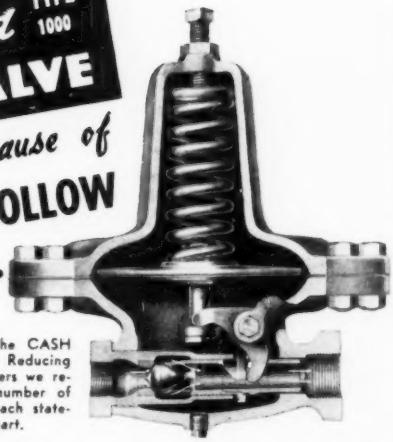
# TROUBLEMAKERS . . . CHECKED OUT OF PLANTS USING THE




## CASH STANDARD Streamlined PRESSURE REDUCING VALVE TYPE 1000

. . . . it's done because of

## BENEFITS THAT FOLLOW INSTALLATION . . .



Below is shown 10 benefits obtainable with the CASH STANDARD Type "1000" Streamlined Pressure Reducing Valve. Statements from a few of the many letters we receive from users are listed. Each gives the number of benefits realized. Check the letter preceding each statement against the corresponding letters in the chart.

**A** A Maintenance Engineer checks 7 of the points and says, "We have experienced excellent results."

**B** A Tire Company in checking 10 points says, "We wouldn't hesitate a minute in recommending the '1000'."

**C** A Maintenance Engineer checks 10 of the points and says, "We use the '1000' under very adverse conditions and find it perfect in every way."

**D** A Mill Supply Company checks 6 of the points and says, "Said valves can be throttled to practically zero from pressure set at."

**E** A Manufacturer checks 7 of the points and says, "We have found the '1000' to be a very good pressure controller in every way."

**F** A Maintenance Engineer checks 8 of the points and says, "If we had more places to use Type '1000' I would insist on using them."

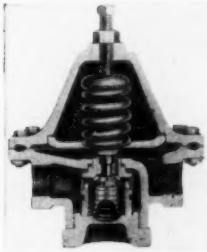
| | |
|---|---|
| A B C D E | **POINT No. 1** Maximum capacity when needed most. |
| A B C D E F | **POINT No. 2** Accurate pressure control under toughest working conditions. |
| A B C E F | **POINT No. 3** Trouble-free service. |
| A B C D E F | **POINT No. 4** Smooth operation. |
| B C E F | **POINT No. 5** Tight closure. |
| B C D | **POINT No. 6** Speedier production results. |
| A B C E F | **POINT No. 7** Elimination of failures. |
| B C D F | **POINT No. 8** Cost-saving operation. |
| A B C F | **POINT No. 9** No spoilage. |
| A B C D E F | **POINT No. 10** Practically zero in maintenance. |

CASH STANDARD CONTROLS.. VALVES

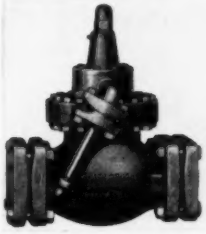
*Send* FOR BULLETIN 962

**A. W. CASH COMPANY**
DECATUR, ILLINOIS

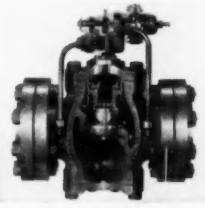
**BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES**
*Send for them*



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

molten lead. This method of maintaining liquid viscosity is particularly suitable for long line transportation where temperature control is a critical factor. Thermal insulation is applied in the customary manner.

A second method of heating pipelines by electricity is by the use of electric strip heaters as shown in Fig. 2. These are clamped to the pipeline with strap irons. Strip heaters are particularly well adapted to short pipe runs, heavy valves and fittings, tank outlets or wherever heat is needed in local applications. An air space is often provided between the strip heater and the insulation by the use of spacer blocks, inserted under the joints of an oversized pipe covering. This air space prevents the direct conduction of heat from the strip heater to the insulation. Many engineers, however, maintain that the doubtful advantages of this air space are nullified by the extra labor required in fitting the pipe covering.

Many viscous fluid lines are jacketed with an outer metal casing. Steam, hot oil or water is circulated through the jacket to maintain the desired temperature of the fluid within the pipe run. Jacketed lines are used to best advantage where the pipe line is adjacent to a steam source which can be tapped into the pipeline jacket. After installation costs, jacketed lines perform their function at virtually no expense; they can be regarded as a form of waste heat applications.

One of the most common methods of applying heat to viscous lines is with a steam tracer line as shown in Fig. 3, suspended directly below the main line. Four to 6 in. is considered a maximum diameter for a steam traced line, but this will vary, depending upon such factors as temperature, pipeline location, type of fluid in the pipeline and rate of flow. This method is generally used where there is an already existing source of steam and where critical temperature control is not required.

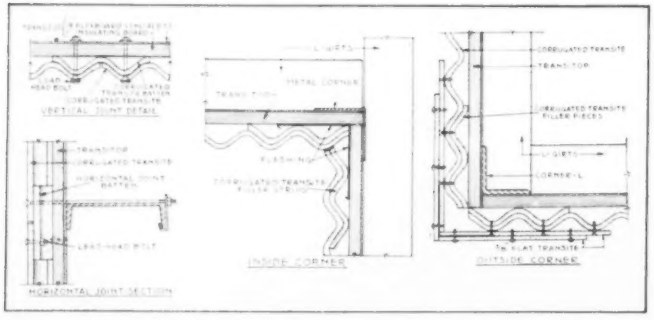
Steam traced lines are insulated by placing a half section of 85% Magnesia pipe covering over the top of the main line and another half section underneath the tracer line. These two sections of pipe covering are jointed on both sides with sections of Magnesia bloc, as shown in the drawing. *From the December issue of Armstrong's Insulator, a publication of the Armstrong Cork Co., Building Materials Div., Lancaster, Pa.*

## Lightweight Wall Construction

In a recent plant expansion program the engineers were confronted with this situation: The original plant was constructed of steel and masonry. The addition planned was to be almost twice the height of the original building, yet where it joined the existing building the existing foundations were to be used. This meant that the new bearing wall with all its extra height should weigh more than the old wall. After careful study by the engineers it was decided to use Johns-Manville Industrial Curtain Wall Construction.

The industrial curtain wall is a system of dry wall construction which consists of a rigid building sheet composed of a core of insulating board and faced with a thickness of fireproof asbestos Flexboard which is then combined in construction with a sheet of corrugated asbestos Transite. The combination insulating board-Flexboard sheet is called Johns-Manville Transitop. In the case described here the sheets are composed of a 1 in. core of insulating board with an inside veneer of a $\frac{1}{8}$ in. thickness of asbestos Flexboard. The sheets are 4 ft by 8 ft in size. The Transitop sheets with the Flexboard facing acting as the interior surface were applied to the outside and were temporarily fastened to the steel framing.

The exterior wall of corrugated asbestos Transite was then applied next to and outside the Transitop and the whole bolted to the steel framing with special bolt fasteners as the accompanying drawings will show. In the particular instance cited here, this type of construction reduced the load bearing factor as compared to that of solid masonry, from 120 lb per sq ft to 20 lb per sq ft. It not only permitted the addition to be safely erected on the old wall foundation, but it permitted the use of less extensive pilings and foundations for the balance of the building. *From Winter Issue of The Power Specialist, a publication of Johns-Manville.*




Typical details of the industrial curtain walls. This type of construction is described as having inherent advantages of fire protection, lightweight and insulating qualities

## Servicing Unit Heaters

Here is a brief refresher on ways and means of conserving fuel and easing the burden on the purse.

1. Clean the fan blades and the heating coils, and straighten any bent fins. It takes but a little grease, dirt, lint or dust on blade or coil surfaces to make a big difference in power costs and in heat transfer. If the heater is connected to the ductwork, see that no obstruction is present in inlet or outlet.

2. Spin the fan manually to make sure it turns freely, and inspect the tightness of the hub setscrew.

3. Clean the motor, commutator—use sandpaper, not emery; the latter short circuits the commutator slots. Check the operation of the electrical control and its settings. If motor wiring has been disturbed, check direction of rotation of motor.

4. See that pipe joints, valve stems, and other parts are tight, especially on a vacuum system. Clean the sediment pocket in the return leg. Check steam and return valves to see if they are fully open.

5. Most important of all: Make certain that each unit heater is equipped with a trap of the proper size. Proper trapping of unit heaters may increase their efficiency as much as 50 per cent thus saving tons of coal a season.

Directions for installing traps on unit heaters are repeated here.

1. Attach a short vertical drip leg to unit heater outlet to provide a place where condensate can drain to when steam pressure is off.

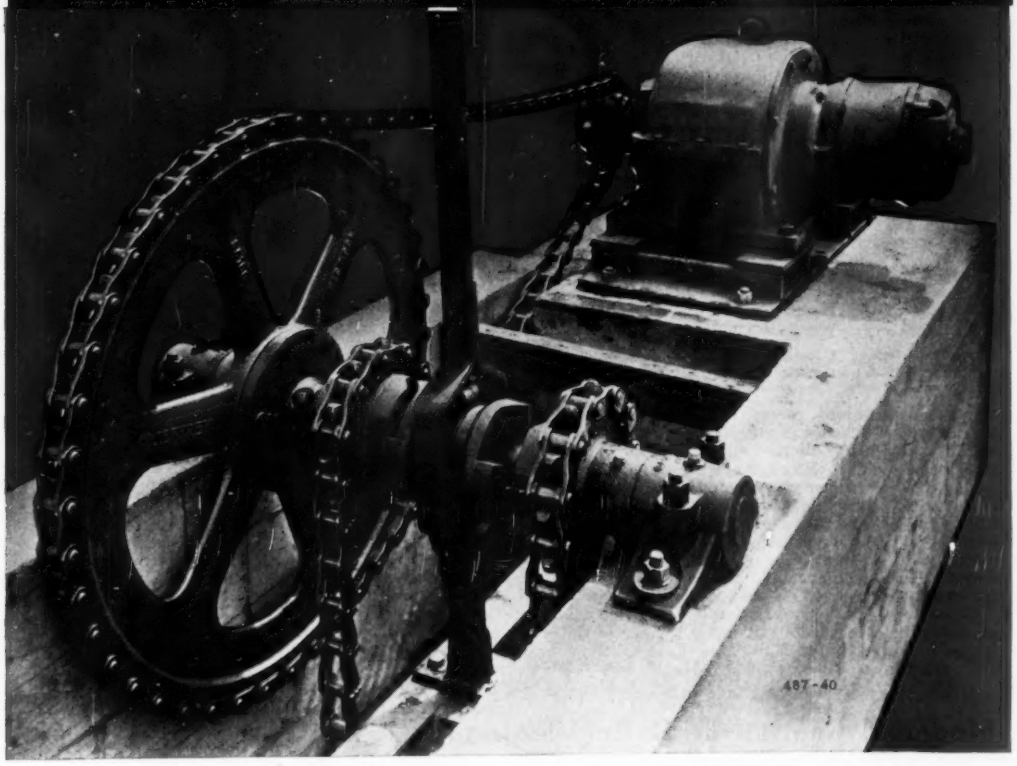
2. Connect line to trap slightly above bottom of drip leg, to leave an easily cleaned dirt pocket to catch scale and dirt.

3. Connect trap close to drip leg Use a trap with ample capacity.

4. Use a trap that will discharge air rapidly, as well as water, and one that does not require condensate to cool before opening.

*From Armstrong Trap Magazine, a publication of Armstrong Machine Works, Three Rivers, Mich.*

# CHAIN DRIVES FOR EVERY SERVICE
## ...including Unit Machinery




**CHAINS** —all standard types of malleable, SUPERMAL and steel roller chains for light to heavy duty drives.

**SPROCKETS** —cast iron, cast steel or Steel Carved—to work with all types of chain. Also idlers and traction wheels.

**TRANSMISSION MACHINERY** —shaft bearings, collars, gears, couplings, take-ups, clutches and shafting.

WRITE FOR ADDITIONAL INFORMATION

# THE JEFFREY MANUFACTURING COMPANY

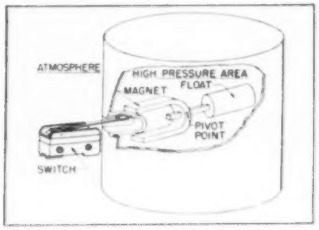
ESTABLISHED 1877

905 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

## Switches on Hydraulic System

SNAP-ACTION switches have recently been installed on a high pressure hydraulic system in our plant to actuate controls as well as an alarm system. This hydraulic system operates at an average pressure of 2700 psi with water being pumped




**One of the switches installed to actuate controls and an alarm system**

against an air cushion. Hence, it was necessary to devise a water level alarm and control circuit without mechanical linkage. Since the system already contained magnetic floats at different levels, the problem was reduced to choosing a switch that could be actuated magnetically with a minimum amount of travel and one which would have no spring return.

Seven such switches were installed at different heights on the water bottle to: 1—indicate high water, sound an alarm, shut off pumping system and actuate an annunciator drop; 2—unload pump No. 1; 3—unload pump No. 2; 4—load pump No. 1; 5—load pump No. 2; 6—indicate low water, sound an alarm and actuate an annunciator drop. This new system has been in operation now for some time and to date we have had very satisfactory results. *By F. W. Douville, Electrical Engineer, Permanente Metals Corp., Spokane, Washington, in Micro Tips, a publication of Micro Switch,* Freeport, *Ill.*

## Proper Maintenance For Good Lighting

Here are a few tips on how to maintain a lighting system so that you will get the light you are paying for:

**1. Make periodic light meter check-ups.** Accumulation of dirt on lighting fixtures, burned-out lamps and other causes such as lamp depreciation, voltage drop and light absorption by dirty walls and floors result in a loss in light output from initial lighting levels. A burned-out lamp is readily seen, but the other factors cause a slow and steady depreciation which is not easily detected by the human eye. Therefore, it is suggested that periodic check-ups be made with a light meter.

**2. Clean or repaint walls and ceiling regularly.** The light output of a lighting installation is affected by the color of the walls, ceiling and floor. Dirty or dark walls and ceiling may absorb as much as 80 per cent of the light which strikes them. The lighter the color of the surfaces, the greater will be the amount of light reflected from them.

**3. Establish a regular cleaning schedule.** Dust and dirt are the enemies of a lighting system. They may cut light output by 50 per cent in a comparatively short time. Therefore, it is important that a regular cleaning schedule be established for your lighting fixtures. The appropriate and economical time between cleanings varies with the rate of dirt accumulation on the fixtures.

**4. Check regularly for burned-out lamps.** When burned-out lamps are not replaced, the level of illumination falls off markedly. This is poor economy and usually shows itself in lowered production, increased accidents and production spoilage.

**5. Maintain proper voltage.** Lamp bulbs are designed to give a rated output at a specified voltage. When the lamp operates at a voltage higher than it was designed for, the life of the lamp suffers. Sometimes overloaded wiring causes voltage drop and the light output suffers. This is particularly important with incandescent lamps because as the voltage drops, light output drops much more rapidly. For best results specify lamps designed for the line voltage of your plant. Then check the voltage regularly to see that it stays within close limits. *From Volume XV, No. 5, Industrial Electric Topics, a publication of Duquesne Light Co., Pittsburgh 19, Pa.*

## Models Demonstrate Extinguishing Systems

THE INSTALLATIONS modeled in the accompanying photographs are for the protection of petroleum storage tanks of various sizes.

The Auto Induction type, as shown in Fig. 1, is operated as follows. If permanent piping is not in place, the hose is coupled between the hydrant and water connection. The pick-up tube is inserted from the primary inductor into a drum of foam compound; next the hydrant valve is opened. The installation shown in Fig. 2, is designed for one man operation. All that is necessary is to open the water valve and selector valve to tank or foam hydrant having the company's Foam Playpipe installed thereon. *From the 42nd issue of Firefax, a publication of Pyrene Mfg. Co., Newark, N. J.*

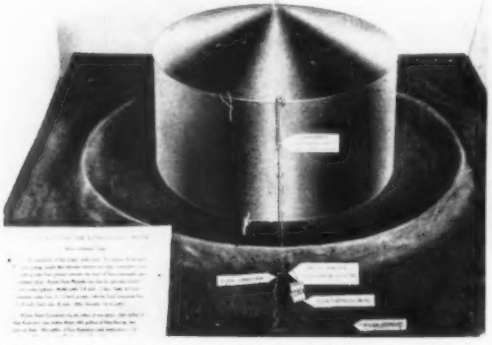


**Fig. 1. This model shows the Auto Induction type of air foam fire extinguishing systems, designed for protection of largest tanks made**

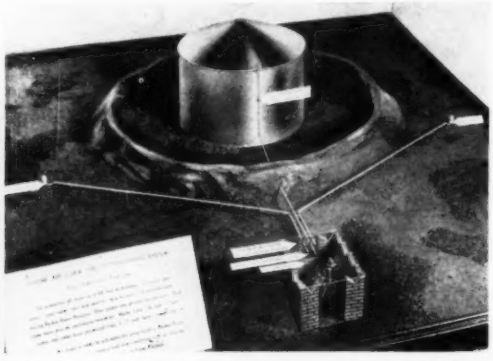
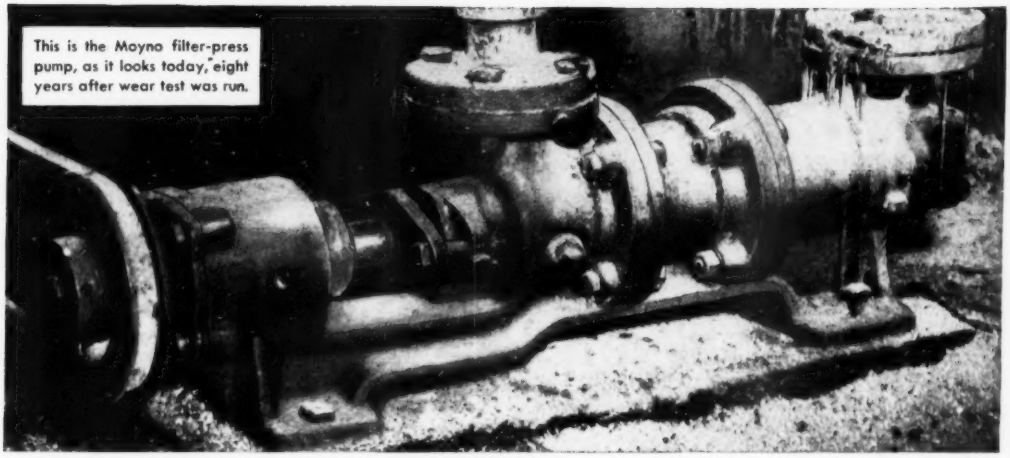


**Fig. 2. This model shows the foam proportioning tank type of fire extinguishing systems, designed for protection of tanks up to 60 ft in diameter**



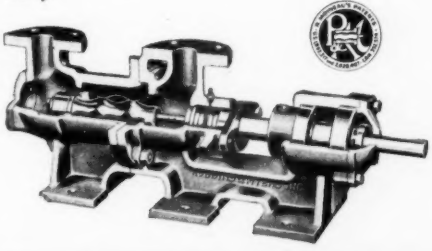

# MOYNO

## LOSES ONLY 1/3 OUNCE IN WEAR TEST

● Here's more proof that R & M Moyno "Progressing-Cavity" pumps can *take* it. A famous lacquer manufacturer carefully weighed the pumping elements of a new Moyno, then pumped 100,000 gallons of lacquer containing an abrasive filter-aid. Re-weigh showed a loss of only 9 grams—*less than ⅓ ounce.* At 500,000 gallons, another check showed *no further change.* Apparently, initial use had merely polished the rotor and stator.

**MAINTENANCE PRACTICALLY NIL** . . . This Moyno is still going strong after more than eight years' daily use. Not a penny was spent for upkeep in the first two years; the total has averaged *less than one dollar a month*—a sharp contrast to previous repair costs. Like other Moynos, this pump has paid for itself *many times over* in maintenance savings alone.

**MOYNOS MAY BE *YOUR* ANSWER, TOO** . . . If *you're* faced with pumping problems, investigate these amazing Moyno pumps. "Progressing-cavity" pumping is smooth, non-pulsating, *dependable.* Moynos handle virtually *everything* that will push through a pipe—chemicals and foods, volatiles, abrasive sludges. Bearings are *outside* the pumping compartment; cannot contaminate—or be contaminated. Free Book No. P-22E gives full specifications—write for it, *today.*



**R & M MOYNO® PROGRESSING-CAVITY PUMP**

**ROBBINS & MYERS · INC.** MOYNO PUMP DIVISION
Springfield 99, Ohio • Brantford, Ontario

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS • FOUNDED 1878

NEW·NEW·NEW

# NEW

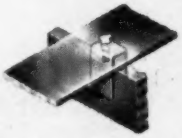
## NEW RACK-OUT MECHANISM

*Built-in rack-out bar and rollers provide a smooth and easy means of inserting the breaker, or withdrawing it to the test position. Thus, inspection is easy.*

## SAFETY INTERLOCK

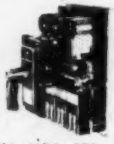
*Mechanical safety interlock prevents connecting or disconnecting the new AK-1 air circuit breaker unless the breaker is in the "open," or "safe," position.*

## IMPROVED BUS CONSTRUCTION



*Raised buses on AK-1 equipments mean longer creepage distance between phases; approximately double that of previous design. This feature cuts maintenance costs.*

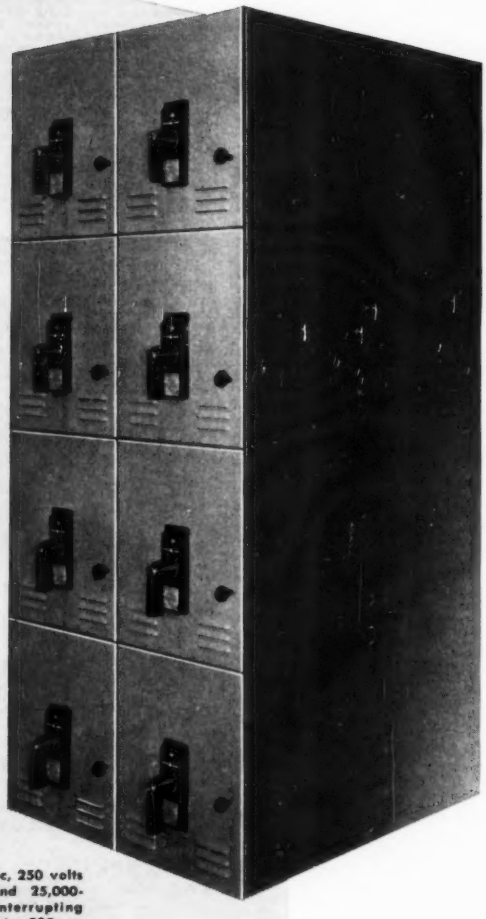
## LOW INSPECTION COSTS



*Breakers of the same frame size are interchangeable. For inspection, merely lift the bar and pull the breaker forward. All parts are readily accessible.*

**Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.**

# DRAWOUT SWITCHGEAR



600 volts a-c, 250 volts d-c; 15- and 25,000-amperes interrupting ratings; 15 to 225, or 35 to 600 amperes.

**WITH THE NEW AK-1 AIR CIRCUIT BREAKER FOR COMPLETE PROTECTION ON LOW-VOLTAGE SYSTEMS**

These attractive new metal-enclosed units require less floor space than previous designs. Also, you now get four breakers—in the same height—where three were before . . . And you get plenty of "IC" (interrupting capacity) for the protection of your production, equipment, and personnel . . .With this new drawout switchgear you can set up completely selective power distribution systems that will eliminate costly production shutdowns caused by unnecessary main breaker tripping . . . Specify *this* switchgear *now* from your G-E sales representative. Write for bulletins GEA-4951 and 4966. "Selective Operation" is described in GET-1485. *Apparatus Department, General Electric Company, Schenectady 5, N.Y.*

GENERAL ELECTRIC

# New Products and Methods

**WHAT'S NEW? Here industrial ingenuity is summarized for your quick review. If you want additional information or have questions on specific applications use the addressed no-obligation, no-postage card between pages 18-19 and 58-59**

## 1—SPEED CONTROL DRIVE

**For small lathes, grinders, pumps and other equipment**

Now available from stock is this Thy-motrol drive, Type H1, furnished in ratings through ½ hp. It utilizes a simplified half-wave circuit to provide d-c flexibility from a-c power. Designed to provide smooth, stepless speed control on small lathes, grinders, drill presses, conveyors, pumps and mixers.

Operates from 220v, 60 cycle a-c. Has a 20-to-1 speed range from 1725 to 86 rpm and operates in ambient temperatures

from 50 to 104 F. In non-reversing or reversing types, latter has separate magnetic reversible switch. Designed for constant torque loads under normal conditions this drive provides speed regulation from no load to full load. Speed may be preset or varied during operation. Dynamic braking permits quick stopping. Maximum tube life is obtained when voltage fluctuates no more than 5 per cent. Electric panel is mounted in compact vestibule enclose. Easily wired, terminals are at front of panel and separated from tubes. Inexpensive, prices begin at $168. General Electric Co.

## 2—RING PACKING

**Non-extrusion, for seals in swivel joints, cylinders and struts**

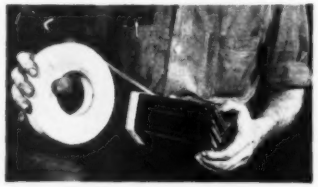
Originally designed for aircraft reciprocating and static hydraulic service, this new Palmetto G-T ring packing is applicable for diversified industrial uses including those where pressures are considerably above average. For rod or piston assembly,

applications cover all systems except those of continuous rotary motion. Can be used in any hydraulic or pneumatic system where positive seal is necessary, as a static seal where there is reciprocating motion with either constant or impulsed pressure; where temperature zone is from 70 to 250 F, and with working pressures up to 3000 psi. Greene, Tweed & Co.

## 3—PAPER TAPE

**Exceptionally strong, for heavy duty packaging and shipping**

A paper tape advertised as strong enough to compete with metal strapping and rope is now available. Has tensile strength of 180 pounds per inch of width. Designated as No. 320 in "Scotch" brand tape line, it's more than twice as strong as manufacturer's next strongest tape.



Use of this tape eliminates packaging equipment and saves workmen cuts and similar injuries. Tape is thin (13-15 mils) and flexible. Has pressure sensitive adhesive which grips upon contact. Strength is due in part to permanently imbedded threadlike lengthwise fibers. Its tear resistance tests greater than 1600 g-cm.

Designed for use in packaging metal pipes, conduits, rods, rolls, sheets, coils, fittings and tubing by wrapping once around and back on itself. Minnesota Mining and Manufacturing Co.

## 4—CLEANER-SNUBBER

**Combines intake air cleaning and noise prevention**

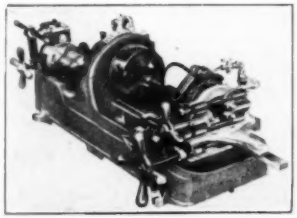
This new line of combination air intake cleaner snubbers was developed as economical method of providing clean and quiet intake air. May be used on all 2- and 4-stroke cycle stationary engines of Diesel, gas or direct-fuel type. Also adaptable for intake of all centrifugal and positive displacement compressors and blowers requiring a compact combination intake air cleaner and snubber. Units are assembled in pipe sizes from 8 to 30 in.

Cleaner-snubber has two alternate connections to engine intake—a side connection with intake pipe extending through side of building, and a base opening permitting use of down pipe from engine with horizontal run under floor to intake snubber. Unit consists of two snubbing chambers: one for smoothing air and for cleaning. Cleaner sections are serviced through one or more doors held in place by spring clamps. Burgess-Manning Co.

## 5—THREADING MACHINE

**It is durable and portable; has automatic switch lock**

This portable power tool, manufacturer's Model B, has power for threading ⅛ to 2 in. pipe and ¼ to 1½ in. bolts. With



drive shaft and geared tools will thread up to 8 in. pipe. Built for long service, but light enough for field, shop and industrial plant use. Weighs 225 lb. Operates with universal a-c or d-c motor of 110 or 120 v—25 to 60 cycle.

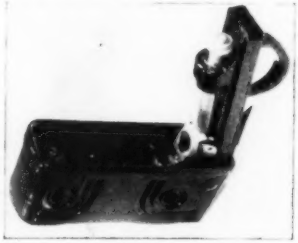
New and exclusive features claimed for this threader are automatic switch lock and chuck wrench holder. Eccentric spool pipe-steady (independent of spindle) absorbs "whip" of long lengths of revolving pipe, reducing spindle wear and insuring better threads. Gear-driven oil pump provides ample flow of coolant, insuring long die life.

Threader has quick-opening, adjustable ring-type die heads; ball-bearing, self-centering wheel and roller cutoff; motor with reversible switch; right hand operation; 13-in. working space; rack and pinion feed gears enclosed in oil; oil level indicator in gear case; all-steel three-jaw universal chuck; 186 available dies. Beaver Pipe Tools, Inc.

## 6—DISTRIBUTION CUTOUT

**For installation where high capacities are required**

Recently announced Type HC cutout has an interrupting capacity of 8000 amp at 2500 v, or 5000 amp at 5 kv. It's rated at 5 kv, 50 amp, and will take any standard universal type fuse up to its capacity. Applicable for use on 2400 v delta, 4160 v Y, 4800 v delta, and 8300 v grounded Y



systems. Cutout consists of porcelain box used in current EA standard interrupting capacity and new high-strength, high capacity door.

Door can be purchased separately for replacement for existing doors of standard EA cutout. High interrupting capacity is obtained by removing old door and installing new one with no change in cutout box or wiring. Both dropout and non-dropout doors are available for installation on existing EA cutouts where short circuit currents have grown beyond ratings of existing cutout. Westinghouse Electric Co.

## 7—AIR COMPRESSORS

**With large bore and stroke; operate at slower speeds**

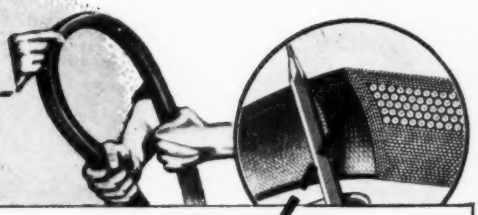
These massively built, four-cylinder V-type compressors come in 7½ hp and 10 hp sizes, providing 30 and 40 cu ft displacement at 175 lb pressure, 37 and 50 cu ft as low pressure models, 100 lb. Mounted on bed plate only, or over 80-gal tanks, ASME or standard. Bore and stroke of low pressure cylinder is 4-¾ in. by 3 in. Illustration shows continuous unloader, available as accessory but needed only in installations where machine operates constantly. A centrifugal unloader for positive unloaded starting is standard equipment.

Compressors operate at slow speeds, only 490 rpm for 7½-hp and 650 rpm for 10 hp-size. Finned cylinders and cast iron inter- and after-cooling units are directly

*Grip the Sides of*

# ANY V-Belt...

**FEEL the Sides CHANGE SHAPE**
**as the belt Bends—**



## -That SHOWS you Exactly WHY THE CONCAVE SIDE

(U. S. PATENT NO. 1813698)

## SAVES You MONEY

***Bend any V-Belt and you can actually feel its sides change shape.***

That's because the bending puts the top of the belt under *tension,* while the body undergoes *compression.* Naturally the sides of the belt *bulge out*—and if the belt is built with *straight sides,* you get the result shown in Figures 1 and 1-A, below:—

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Clearly, the bending forces a straight-sided V-Belt into a shape that does not fit the sheave-groove—and the bulging produces excessive wear along the *middle* of the *sides.*

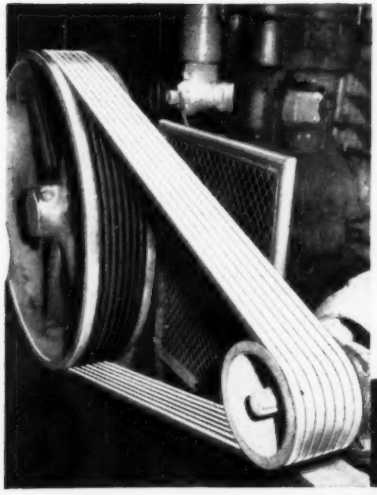
Now, bend the V-Belt built with the precisely engineered Concave Side (U. S. Patent No. 1813698)—the Gates Vulco Rope.

Gates Vulco Rope With Concave Side.

No Side Bulge. Precise Fit in Sheave-Groove.

You get the same shape change but *now* the new shape *exactly fits* the sheave-groove as shown in Figures 2 and 2-A.

Results—(1) *Uniform* side-wall wear; *longer* life. (2) *Full* sidewall grip on the pulley; carries heavier loads and sudden load increases without slippage — a big increase in drive efficiency — saving belt wear and also saving power!



### The Concave Side is *MORE IMPORTANT NOW* Than Ever Before

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side naturally delivers greater savings today than ever before.

THE GATES RUBBER COMPANY
DENVER, U. S. A.
*The World's Largest Makers of V-Belts*

Gates
REG. U. S. PAT. OFF.

The Mark of SPECIALIZED Research

492

**GATES VULCO ROPE DRIVES**
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

in blast of air from large propeller-type flywheel. Two oil immersed automotive-type intake mufflers and filters are provided. Pistons have three compression rings and one oil-control ring. Crankshaft is drop forged steel, with Timken roller bearing with external adjustment. Disc-type intake and exhaust valves are interchangeable, readily disassembled. Wayne Pump Co.

## 8—PAINTING GUIDE

**Works like a slide rule to simplify selection. Just ask for it**

The plant engineer's task of selecting paint for industrial use is simplified by the Valdura Painting Guide, a cardboard gadget which operates like a slide rule to give "at-a-glance" paint information. User merely sets scale at "surface to be painted" and automatically small windows

show necessary surface preparation, recommended primer, correct finish coat, colors, characteristics of finish, and proper thinner.

Guide measures 4 by 9 in. Typical uses noted for specific finishes include acid rooms, galvanized metal, stacks, and water tanks. Exceptionally hazardous jobs, extreme temperature and unusual atmospheric conditions are provided for. Instruction sheet for guide is included. American-Marietta Co.

## 9—HEATER CORD

**And cordset with new type of insulation**

Longer service life, greater resistance to abrasion, resistance to water and oil and elimination of kinking are advantages claimed for Preen-X heater cord and cordset utilizing new principle of insula-

tion. It eliminates the asbestos conventionally applied over rubber insulation on older type heater cords. New cord is solid looking, with smooth rubber-like appearance. Carries full Underwriters Laboratories approval for applications up to 90C. General Electric Co.

## 10—SLIDE RULE

**Tells correct circuit breaker size by flexible, comprehensive means**

This slide rule is a simplified means for determining the correct size air circuit breakers for all industrial substation applications.

To maintain continuous production, and to protect personnel and equipment, it is important to have breakers large enough to handle any short circuit current they may be called upon to interrupt. Not only should breaker capacity be carefully calculated before installing new substations, but in every plant a check should be made to determine the adequacy of breakers now in service.

With this rule, anyone can easily calculate the interrupting capacity of the 600-v class air circuit breakers needed for control of power in all industrial plants. Use of the slide rule constitutes a more flexible and comprehensive means of properly applying breakers.

The Unit-Sub rule has been constructed from standard AIEE formulas for determining short circuit currents, and takes into consideration all necessary factors, such as motor load and d-c component. While the slide rule has been specially developed for use in load-center unit substation applications, it can be used to check breakers on any system. It applies to direct connected as well as cascaded breakers. Allis-Chalmers Mfg. Co.

## 11—GAS VALVES

**With electric diaphragm, for control of petroleum gases**

These valves are designed for control of natural, manufactured, mixed and liquefied petroleum gases to space and unit heaters, furnaces, and boilers. Valve is silent and has no packing glands or bellows. For low-line voltage applications. Operates on current consumption of 5 watts. Standard model and manual opening model are available with or without electric trip. Envelope size of valve permits easy adaptation to any gas-fired heating installation.

All body parts are die formed aluminum of high density and tensile strength. In seven sizes, from $\frac{3}{8}$ in. to $1\frac{1}{2}$ in. Also available in packaged sets including snap-action thermostat and transformer and thermostat cable. General Controls Co.

USE THE POST CARD

## 12—MAGNETIC STARTERS

**These A-C units, for starting and protecting motors, are dirt-safe**

A complete new line of a-c magnetic starters is now in production. Designed for starting and protecting motors up to 50 hp, the new full-voltage starters are furnished in all NEMA sizes from 0 through 3. The contractors can be furnished in NEMA sizes from 00 through 3.

An important feature of the starters is the sturdy, one-piece plastic-encased coil enclosure which effectively protects the windings against dirt, moisture, or possible damage during installation. The clamp-type coil terminals are firmly embedded in this enclosure to prevent loosening.

The silver contacts are easy to inspect, interchange, and remove without the use of special tools. Their large striking surfaces spread any wear over a broad area, thus assuring long life, and the high initial tip pressure of the contact springs practically eliminates the possibility of tip welding. In addition, an arc shield of cold-molded asbestos prevents arc-over between contacts. The silicon steel magnet is exceptionally durable and has a permanent air gap in a non-wearing surface to insure quick dropout. All steel parts are zinc plated. General Electric Co.

## 13—FLUORESCENT FIXTURES

**In types for standard industrial and textile mill use**

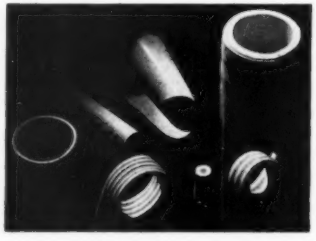
These "Slimline" fixtures are designed for use with 96 in. T-8 lamps and available with 200 ma or 300 ma ballasts. New features include choice of baked enamel or porcelain enamel tops, reflectors with vitreous enamel finish, units available for

continuous or individual installations. Center lamp support, said to prevent vibration of 8 ft lamps can be provided. Textile mill fixtures have peaked top channel to prevent accumulation of fly, lint, dust and moisture. Wheeler Reflector Co.

## 14—SILICONE RUBBER

**Improved new type is available in many industrial products**

X-7 Silicone Rubber, a new material claimed to have more than twice the re-



sistance to permanent compression as former types, and somewhat greater tensile strength, is now available in gaskets, washers, diaphragms, grommets, seals, packing and tubing. Suitable for dielectric applications, X-7 Silicone Rubber is said to be practically unaffected by temperatures from -160 to 500 F. Even at extreme temperatures it retains rubber-like elasticity.

Recommended for use in handling hot or cold fluids and gases. Won't crack after long exposure. Parts won't turn to carbon despite heat—can be used to replace metal construction in which limited thermal stability has been experienced. Parts resist chemical action of lubricating oils and some chemicals. Should have wide applicational value in electrical appliances, industrial ovens, steam generators, gas cylinders, oil burners, aircraft engines, transformers, die casting machines and refrigeration and air conditioning equipment. The Stalwart Rubber Co.

## 15—BATTERY REVIVING

**Is reported through use of this compound. Reduces sulfation**

Replacement costs, due to shelving of sulfated lead-acid batteries, are said to be reduced considerably by the use of this company's additive salts, known as AD-X2. The manufacturer states that the compound may be added to new batteries as a "sulfation" preventive or added to dry-charge batteries when the electrolyte is introduced; added to all batteries to be stored in a charged condition. The company points out that some industrial concerns have testified to the effect that dead batteries, slated for the scrap heap have been revived and made ready for use by this additive. Pioneers, Inc.

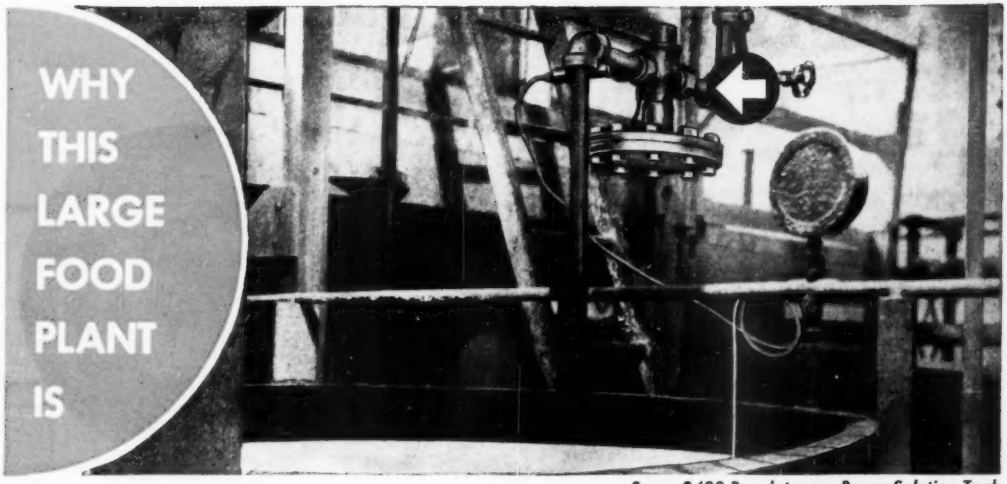
## 16—TRANSMISSION UNIT

**Supplements two-speed motors and provides special ratios**

A two-speed automatic transmission—a unit that may be used to supplement or replace two-speed motors, with not only the advantage of providing a broader range of speeds, but also special ratios

*(Continued on page 22)*

# WHY THIS LARGE FOOD PLANT IS DEPENDING ON SARCO



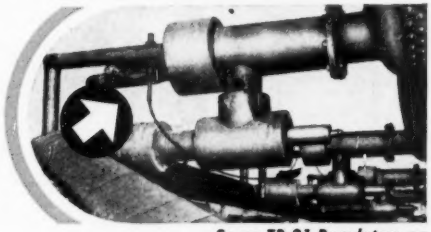
*Sarco 2422 Regulator on Borax Solution Tank*

The public is little aware of the services rendered by the engineering departments in large industrial plants.

To get the last usable heat unit out of every pound of steam; to keep temperatures regulated at all points from receiving tanks to the shipping room—and to prevent the chaos that would result from the failure of any process in the plant—that is why the engineers after years of comparison, made this plant "All Sarco."

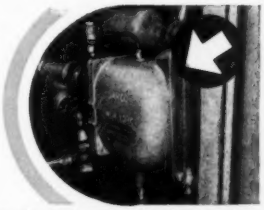
Today, more than 500 Sarco products in thirty types and sizes are used to keep this plant going right. A battery of starch driers, a group of oil tanks, various processes, extensive air conditioning and fuel oil preheat control are operational units of insured performance with Sarco Temperature Regulators.

Such engineers are the advance guard of progress in all industries using heat. The combined developments of all the plants working with Sarco Engineers is available to you. More than 100 ideas are given in the Sarco Hook-Up Book—yours on request.



*Sarco TR-21 Regulators on Oil Receiving Tanks*

*Sarco 2430 Control on Fuel Oil Preheater*



*Sarco Float Thermostatic Steam Trap on Air Conditioning* 234

SARCO SAVES STEAM

**SARCO COMPANY, INC.**

*Represented in Principal Cities*

**Empire State Building, New York 1, N. Y.**

SARCO CANADA, LTD., TORONTO 5, ONTARIO

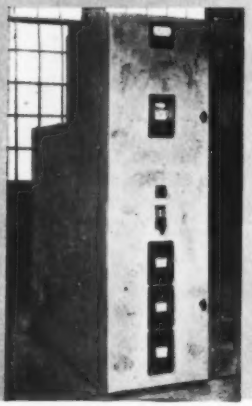
## YOU CAN BE SURE.. IF IT'S

# Westinghouse

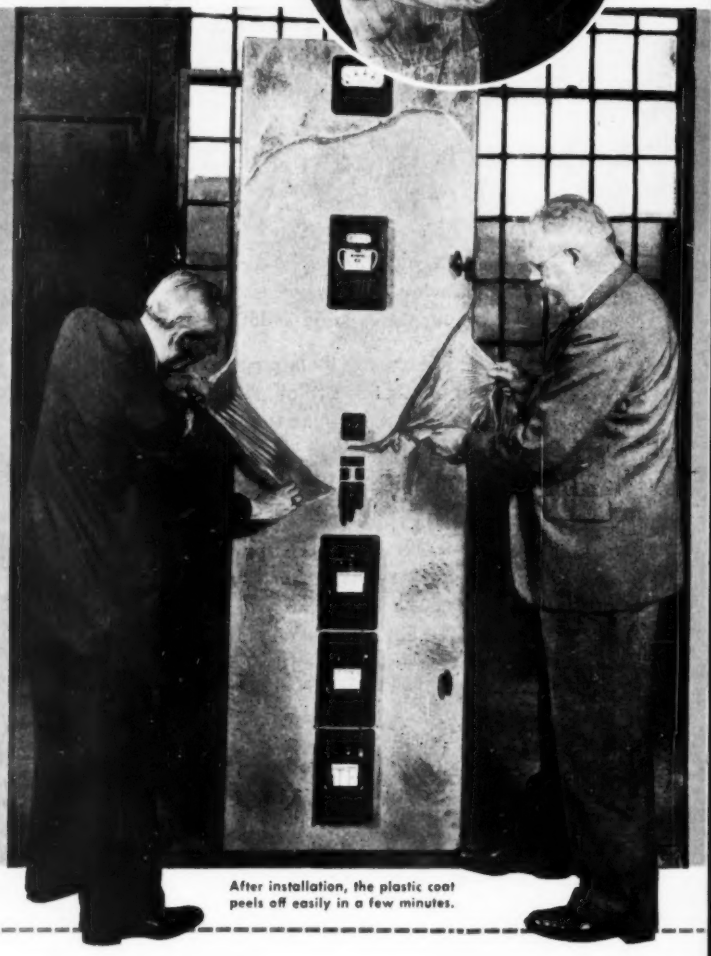
*IN 1947*

**Westinghouse provided All-Weather Undercoating...** Lifetime protection for undersurfaces of *outdoor* switchgear

Plastic coating is sprayed on the switchgear panel before assembly, just after final painting.

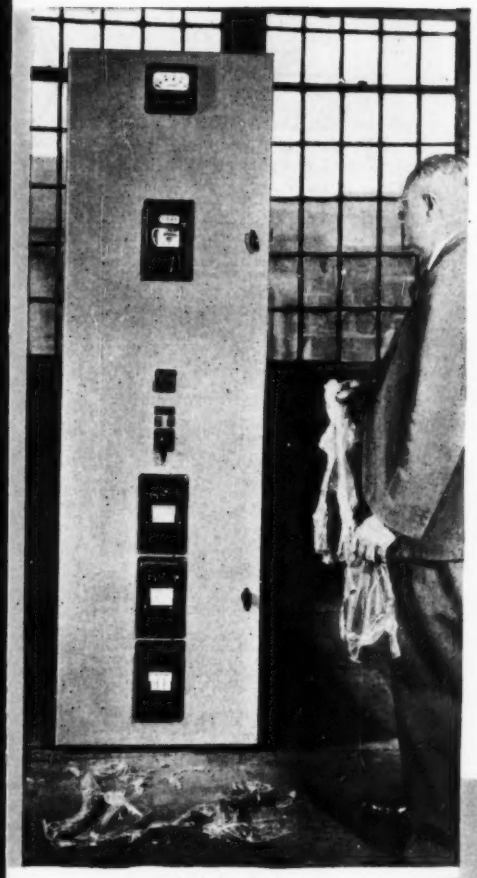


Unavoidable smudges and grease on this switchgear unit affect only the protective plastic coating.



After installation, the plastic coat peels off easily in a few minutes.

# NOW... PLASTIC PROTECTION for Indoor Switchgear



Removal of the plastic coat reveals the original smart appearance of the switchgear unit.

Another Westinghouse
Switchgear Feature
**AT NO ADDED COST!**

Dust, dirt and greasy fingerprints "peel off" switchgear units in a few minutes. The new plastic coating protects the smart appearance of metal-clad switchgear during shipping and installation. No longer is touch-up and repainting necessary to give your installation that "fresh-from-the-factory" appearance.

To give you this added benefit, Westinghouse employs a transparent plastic material. Sprayed on indoor metal-clad switchgear panels after final painting, it forms a tough protective coating that protects the finish through final assembly and wiring—and during shipment and installation. When the switchgear is ready for operation, simply "peel off" the plastic coat. Your installation then reveals the original factory finish. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

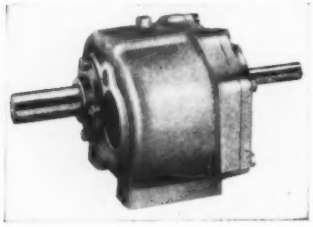
J-60689

**Westinghouse**
**METAL-CLAD SWITCHGEAR**
**FOR ANY SYSTEM**

# New Products and Methods

(Continued from page 18)

not obtainable with standard two-speed motors has been announced. The mechanism consists of two over-running clutches, one engaging in a clockwise and the other in a counter-clockwise direction so arranged that by merely reversing the motor, two speeds are provided (one at the 1.1 ratio and the other at a pre-selected reduction) on the output shaft without changing its direction of rotation.



The reversing operation is accomplished by means of a push button, limit or timing switch. In the five horsepower (illustrated) model with a 1750 rpm input the low limit is a reduction of 6.31 to 1 but any pre-selected ratio from 1.1 to this low limit is obtainable. The transmissions are built to handle 5, 10, 15, 20, 25 and up to 50 hp motors. Western Mfg. Co.

## 17—LIGHT-WEIGHT TRUCKS

**For fast maneuvering and tiering; able to manipulate 2000 lb**

A relatively small, light-weight, electric power industrial truck for fast maneuvering and tiering loads that are not excessively heavy has been developed. Designed for requirements in large merchandise warehouses, it is equally applicable in many manufacturing and shipping departments.

This truck weighs only 4550 lb including battery, yet it can safely manipulate loads up to 2000 lb, it is reported. This feature makes it suitable for continuous work where floors and elevators are of moderate capacity.

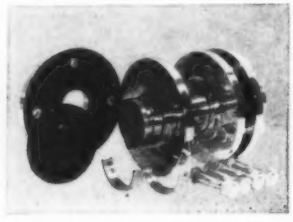
Compact, it can maneuver in narrow aisles and areas. Length overall with 30-in. fork is only 96 in.; width 32½ in. This with straight-line steering mechanism enables it to turn in 60-in. intersecting aisles and in 109-in. right-angle aisles. A low center of gravity contributes to safe-handling under all working conditions.

Straight travel speed with full load is 5¼ mph. Maximum height of lift of fork is 121½ in. Lifting speed loaded is at a rate of 28 fpm lowering load rate 45 fpm. Safety valves control lifting and lowering. Elwell-Parker Elec. Co.

## 18—PIPE JOINT

**Is easily and quickly installed in rubber lined pipe**

Here's a device, called the Gaco Joint, which is claimed to cut insulation and repair costs by as much as 50 per cent. Lined pipe may be bought in sections



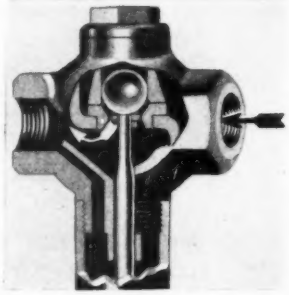
which can be installed right on the job in a few minutes, requiring no detailed layout plans or welded fittings. By keeping a supply of these joints in stock repairs can be made by plant maintenance crews, thus avoiding lengthy shutdowns. Gaco Joints come in 1½ to 4-in. pipe sizes as 45 and 90 deg ells, Y's, tees and separate flange kits for connecting straight lengths. Pipe is cut, grooved, bored or counterbored with special machine or regular pipe machine with adapter. Kit for adapting user's own machine is available, or special machine may be bought or leased. Gates Engineering Co.

## 19—INNER VALVES

**Ball type, for regulation of steam, water, air or gas**

This line of valves was designed for "accurate regulation, greater capacity and tight closing," for applications which require regulation at inlet pressure less than 250 lb, reduced pressures below 150 lb and where reduced pressure must be adjusted frequently.

Valves are single seated with ball inner valve actuated by rubber diaphragm. Ball centers freely on seat with uniform contact all around and closes tight the moment it seats. When off seat, ball is free to turn, so all parts are equally exposed to flow, assuring even distribution of wear. This construction is said to prevent mis-



alignment or sticking. Smooth passage between ball and seat bevel permits high flow capacity. Ball and seat are stainless steel; ball is forged and heat treated and ground to perfect roundness. Klipfel Mfg. Co.

## 20—LIGHTING CONTROL

**Photoelectric relay for interval night illumination**

Here's a new single unit control for use on transportation terminals, freight loading areas, parking lots, commercial signs, display windows and factory yards. Consists of light sensitive photorelay, which turns on lights at preset values of daylight, and built-in time-switch, which turns them off at any preset time. Time-switch can also turn on lights early in the morning and the lights remain on until sufficient daylight activates photoelectric relay to shut them off.

Advantages claimed for this lighting control are compact size of unit and dependable action regardless of weather or location, providing a safe illumination level in busy work areas. Installation and location are simple—only precaution is to face control to north and avoid facing phototube directly into sun. One model operates on standard 115 v a-c, other on 230 v a-c. Fisher-Pierce Co.

## 21—CUTTING TOOL

**For sheet metal; it's portable and unusually maneuverable**

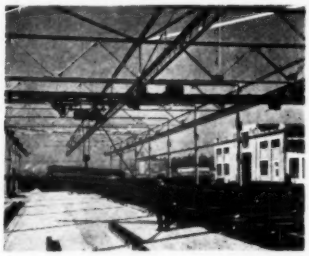
Circular cuts with radii as small as 1 in. are claimed possible with a new sheet metal cutting tool called Nibblex. Cuts sheet metal up to 20 gage (0.040 in.) without bending, burring or stretching metal, and gets into places where average power tool can't reach. Especially handy for smooth, quick job on corrugated sheet or pipe; cuts plastic sheet, too. This tool

is pocket-size, weighs only 13 oz. and is easily attached. Can be fixed in chuck of any ¼ in. motor in same manner as a drill. Unit consist of seven simple parts, any of which can be replaced at little cost. Nord International Corp.

## 22—OVERHEAD CONVEYORS

**In 500- to 20,000-lb capacities for hand or motor operation**

A leading feature of the Trambeam crane and monorail system is flexible suspension of track or runway beams from building structure, accomplished through ball and socket connection at each end of beam. This is claimed to prevent distortion in supporting rods and to permit even distribution of load for smooth easy travel, even around curves, affording greater safe-



ty and protecting structure against torsional strain.

Industrial applications of the Trambeam system are said to be almost unlimited, and it can be adapted to simple or complicated handling systems, providing efficient overhead transportation to all sections of the plant. Other important features are vari-pressure drive and tractor drive and full-vision cab. Whiting Corp.

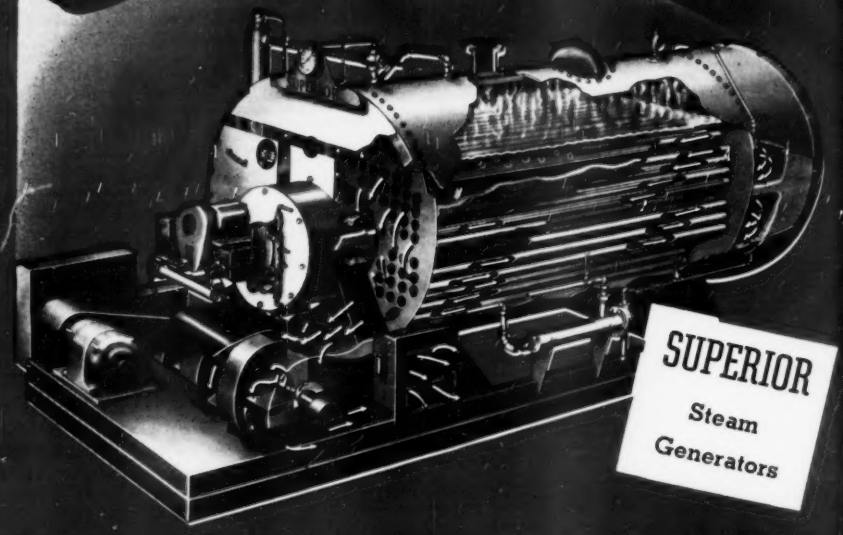
## 23—REMOTE CONTROL

**Low voltage control system for lighting, alarms, machinery**

Although developed for lighting and appliance circuits, this low voltage control system is applicable to alarms and signals, yard and night lights and control elements on machinery and equipment. Small remote control relays which handle load can be install in knockout of nearest outlet box. Individual relays are controlled by any number of conveniently located switches operating on a 24 v system. One relay can be operated from any number

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 58-59

YOU CAN *See* THE DIFFERENCE




Obviously you can't actually see the 80% guaranteed thermal efficiency . . . but you CAN see the evidence of SUPERIOR design and construction which achieves the result.

You CAN see the built-in induced draft . . . the 4-pass design with ample heating surface. You CAN see the SUPERIOR Rotary Burner for fully automatic operation with ALL grades of oil (gas or [illegible] oil if you prefer) . . . louver-type dampers providing [illegible] of air supply . . . the unusually large steam space (providing ample reserve capacity) . . . the large evaporating surface.

Through an engineer's eyes, it all adds up to Superior performance.

Superior Steam Generators are available in 17 sizes ranging from 20-500 h.h.p. for pressures up to 250 lbs. For complete details, write for Catalog 105.

Superior Combustion Industries, inc.

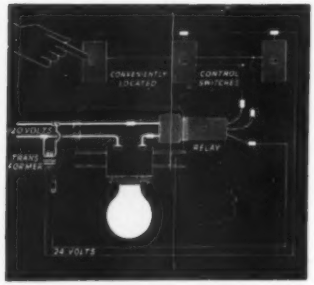
*Factory*: Emmaus, Pa.

*Executive Offices*: Times Tower, Times Square, New York 18, N. Y.

## New Products and Methods

of control switches at several points or several relays can be operated from one point by hand or motor operated master switches.

Remote control enables user to light the path ahead of him by turning on lights in area before him while turning out those in area behind him. Any number of




control stations can be operated in parallel. Economy and safety are features of the low voltage circuit. Master system permits control of selected lights from single point, or switching of all or a certain group of lights from master control station. Makes possible sudden flood lighting of an industrial area as protection against illegal entry or as safety measure. Square D Co.

### 24—FLOOR MACHINE

**Explosion-proof, for cleaning in hazardous industrial areas**

Machine MC-EX was designed specifically for floor maintenance in petroleum refineries, chemical and munition plants, mills, and other places where a spark could set off an explosion. It cleans, scrubs and polishes floors formerly cleaned safely only by manual labor, and carries Underwriters Laboratories listing for use in hazardous areas. Initial users are said to have given it unanimous approval.

Construction features include General Electric motor, flexible couplings and totally enclosed safety switch. Dual a-c 110 or 120 v capacity conductor type motor is 1 3 hp for the 14-in. machine, ¾ hp for the 16 in. Heavy duty cord is a three-conductor type with ground jack. Has adjustable handle and center balance for easy operation and bronze castings at points of strain. Flip-up wheels require no lubrication. Multi-Clean Products, Inc.

### 25—LIFT TRUCK DRIVE

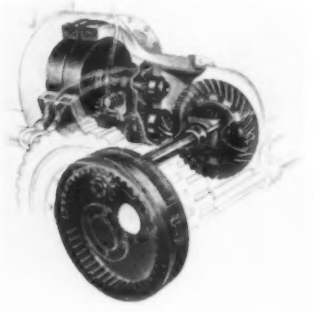
**Eliminates clutch, permits quick reversal of direction**

A new development in fork-lift trucks, called the "Dynatork Drive," which eliminates clutch, permits immediate reversal of direction, prevents wheel slippage and stalling and increase working speed, has been installed in a 6000-lb capacity truck. Travel direction is controlled by finger switch lever on steering column. Traveling at ordinary speed truck stops smoothly when switch lever is flicked and quickly reverses direction, without release of pressure on accelerator.

Advantages claimed for new drive are increased work because of increased speed and greater maneuverability, less driver fatigue, lower maintenance costs, longer tire and truck life and greater safety.

By means of new drive, power from truck engine is transmitted by magnetic induction. Two magnet coils (mounted within flywheel and surrounded by magnetic poles) rotate with flywheel and are driving members, one for forward and one for reverse. Two rotors attached to a special constant-mesh-gearing are driven members. Magnetic induction force is applied through air gap, no metal-to-metal contact between driving and driven members. Only wearing parts are inexpensive brushes on collector rings mounted on flywheel.

Switch lever controlling truck movement has three positions: forward, reverse and neutral. Two speeds—high, for most functions, and low, for extreme grades or emergency operating conditions—are provided. Operating speed is controlled by conventional accelerator. For "inching" there's a special foot pedal to left of steering column. Clark Equipment Co.

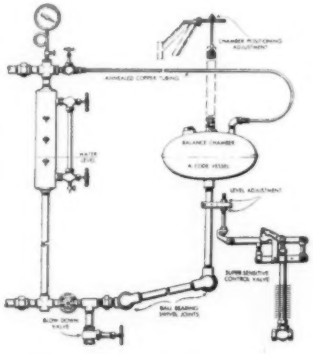


### 26—FEED WATER CONTROL

**Uses weight of water to motivate feed water control valve**

Heat and cold are said to have no effect on the "Weight-O-Water" control, because no heat is required to operate it. This controller uses an elypsoidal balance chamber, a code vessel hung on a spring, to permit its rising and lowering. At top of chamber an annealed copper tubing is connected and flexibly looped to commensurate with water column piping of boiler. Chamber is connected to bottom of water column with piping.

Perfect equalization of levels is provided. Up-and-down movement of chamber actuates a super-sensitive control valve requiring a force of less than ½ lb to actuate. Valve opening and closing in response to this movement controls

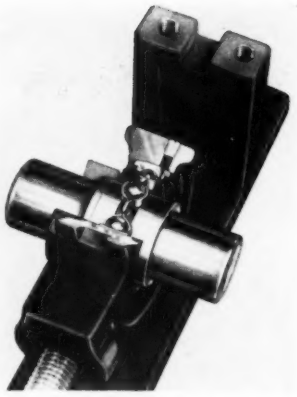



amount of water fed to boiler. Extreme sensitivity is afforded by elimination of stuffing gland and substitution of an 8 in. Neoprene stem seal. Fins on bonnet extension of valve dissipate heat and prolong seal life. J. A. Campbell Co.

### 27—TAKE-UP UNITS

**Have pre-lubricated ball bearings with self-locking collars**

As an addition to its line of Mechani-Seal ball-bearing power transmission units, this company announces a series of take-up units for conveyor construction, shaft adjustment and tightening devices. Designated as Type LTU these units come in shaft sizes from ¾ in. to 2-7 16 in. and incorporate pre-lubricated, self aligning wide inner ring ball bearings with self-locking collars and Mechani-Seal feature.



This seal construction is said to be frictionless and to provide the effective seal operation of an unusually long labyrinth plus that of an external slinger. An inner steel plate shield attached to bearing's outer ring retains lubricant, while rotary slinger attached to inner ring throws off contaminants. The Fafnir Bearing Co.

### 28—FROST PROOF HYDRANTS

**Self-de-icing for outside surface connections to a buried main**

This new approach to frost-proof hydrants involves no underground pits, sump pumps, heating coils or other equipment. Water actually freezes in portion of hydrant above frost line. No water is drained off below ground. Inside a rubber-lined riser-spout, which runs entire length of hydrant to below frost line, is a rubber tube. When valve is opened water flows through. With water pressure on, rubber tube expands against riser-spout, allowing full column of water to flow. When water pressure is off, rubber tubing contracts. In cold weather the column of water inside the tube freezes; but when valve is opened, water pressure expands the tubing and water flows around the "pencil" of ice which breaks up and flushes out with the water.

Composition disc type valve operates by lever and cam arrangement. Hydrant is sanitary, has no underground drainage holes for picking up polluted water. Crane Co.

### 29—VIBRATING SCREENS

**New line of inexpensive, light-duty units for separating, etc.**

These small, sturdy vibrating screens have been designed to simplify a great number of small screening jobs often performed slowly and tediously by hand in many industrial plants. Any job of separating materials to size, dedusting or reclaiming may be handled efficiently and economically with a Mighty-Mite vibrating screen.

Specifications: Single and double deck

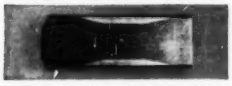
*(Continued on page 53)*

# Do you know how the new Metallizing method can help you slash repair costs?

**Knowing the right answers to these questions might help you cut repair costs very substantially.**

**Question** *Will metallizing give me a good job every time?*

**Answer**—Yes. Previously, when preparation for metallizing involved *seven* separate steps, a slip-up in any one step could result in a poor job. But now, Metco's new Sprabond enormously simplifies preparation. You spray this new self-bonding material directly on smooth steel and many other materials with no preparation beyond thorough cleaning. You get a perfect bonding surface. You get a good job every time.



*Cut-away view showing typical build-up over Sprabond preparation coat on steel shaft section. With Sprabond, dovetailing of the coating is often unnecessary and the metallized build-up may be brought to a feather edge.*

**Question** *Where does metallizing pay off?*

**Answer**—It's ideal for the repair of worn machine parts. It is not recommended for use on parts subject to severe impact (dies, punches, etc.); point stress (ball bearings, etc.); or elongation (gear teeth, threads, etc.). *But it will cut repair costs as much as 90%* on parts such as pump shafts, crankshafts, motor shafts, turbine shafts, transmission and worm shafts, spindles, lathe beds, pump plungers, impeller shafts and many others. Also good for fast, economical repair of cracked engine blocks, heads, casting defects, permanent molds, patterns, etc.; thin sections which would be distorted by other methods; strongly bonded coatings on aluminum and magnesium.

**Question** *How fast is metallizing?*

**Answer**—Modern metallizing guns deposit as much as 20 lbs. of steel per hour. With the new Sprabond process, you can put repaired parts back in service, often in a matter of minutes, instead of hours or days.

**Just 3 Fast Steps in Restoring Worn Crankshaft Throws**

*1. Rough, cleaning cut taken and Sprabond preparation coat applied. 2. Throw metallized with .80 carbon steel. 3. Throw finished to original dimension.*

**Question** *What other advantages has metallizing?*

**Answer**—Special long-wearing and corrosion-resistant coatings can be applied to inexpensive base metals. Microscopic pores in the surface of the metallized coat form tiny oil reservoirs that improve lubrication, usually outwear virgin metal. Low heat generated (150° to 250° F) eliminates danger of distortion. Metallized surface is smoother, requires less finishing, wastes less metal than other methods of metal build-up; choice of 32 different metals available in wire form.

**Question** *Is metallizing installation expensive?*

**Answer**—No. Metco's four gun models, ranging from the heavy-duty Type "Y," down to the new light-duty Type "L," which operates on 10 cubic feet of air per minute (3 hp compressor), permit choice of installation to fit a plant of practically any size. The original equipment cost is often recovered in the savings of time and material on just one or two important repair jobs.

**Do you have some questions on metallizing that have not been answered here, or a special problem in machine repair? We will be happy to send further information, or have a Metco Engineer call in person. No obligation, of course.**

**METALLIZING ENGINEERING CO., INC.**
38-13 30TH STREET — METCO — LONG ISLAND CITY 1, N. Y.

**FREE BOOKLET**

METALLIZING ENGINEERING CO., INC.
38-13 30th Street, Long Island City 1, N.Y.

Please send free booklet—"Metallizing Saves Money."

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

# General Electric Announces

# 2 ALL-NEW Time-Delay Fuses

## THAT MAKE YOUR PROTECTION EXTRA SURE!

*all-new*

### FERRULE FUSE

This easy-to-renew fuse has a combination of *protection* features and *convenience* features such as you've never had before. Thanks to a newly designed fuse link perfected by General Electric research, protection from harmful overloads is quick and sure — yet, limited transient overloads won't cause unnecessary "blows."

It's a timesaver, too. Only three parts enclose the link. Alignment takes care of itself when a new link is slipped in place. It can't be assembled with the link off-center or under strain. Caps come off and go on by hand. A new label makes identification easy.

You'll be buying these fuses in ratings from 3 to 60 amperes, for 250- or 600-volt requirements. Order a trial lot from your electrical supply house now, and watch them pay off as "headache preventers."

*all-new*

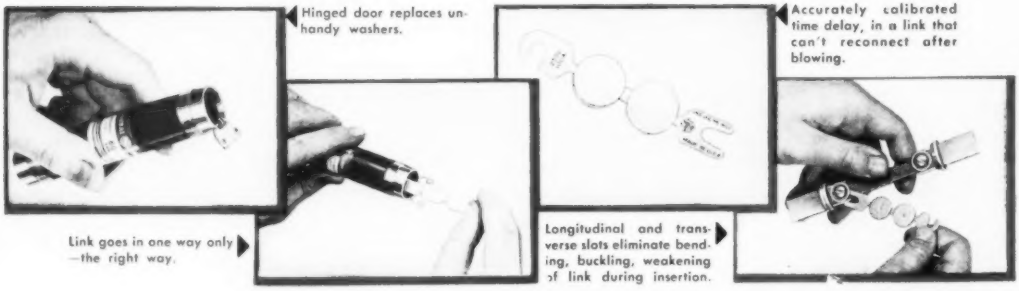
### KNIFE-BLADE FUSE

You won't know which to rate "tops" in this design· the new time-delay link, or the sturdy assembly that makes such short work of renewal. Just remove one end-cap, and the fuse is disassembled. Screws can't fall out, and cup-shaped washers guide the link into place. The heavy-fiber bar-support is securely anchored to the blades. Alignment is bound to be right, even on large size fuses with more than one link.

Notice the disk design of the link sections. No chance here for "blown" link sections to overlap and re-establish contact.

This new fuse line includes ratings from 70 to 600 amperes, for 250- or 600-volt service. Try them once and you'll want them as your *first-choice* fuses.

**For facts on new G-E fuses write to Section D13-383, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.**


Hinged door replaces unhandy washers.
Accurately calibrated time delay, in a link that can't reconnect after blowing.
Link goes in one way only —the right way.
Longitudinal and transverse slots eliminate bending, buckling, weakening of link during insertion.

**GENERAL ELECTRIC**

# RAISING THE ROOF—Scotch Style

**Chevrolet-Tarrytown adds a mezzanine to a single story assembly building in a novel way . . . The new floor is assembled on the ground, the entire structure jacked up 15 ft and new columns are added . . . Hydraulic jacks, care and ingenuity save time, money and material**

SOMETIMES the expression, "raising the roof" means blowing your top, but that was not the case with Chevrolet-Tarrytown Division of General Motors Corp., Tarrytown, New York. With them it was a case of literally raising the roof in a most unusual way.

The operation came about when it was decided to install a mezzanine floor in the assembly wing in order to improve working conditions and secure smoother and more efficient assembly operations. Instead of tearing down the roof, building the mezzanine, and then rebuilding the roof, they decided to save money and material in a novel way.

First they laid the steel girders of the mezzanine floor on the ground and fastened them together so as to form four sections. The columns that supported the roof were then attached to the newly laid girders and freed from the old footings.

After that it was a case of jacking up each of the four sections until the new floor, carrying the roof with it, had been raised the necessary 15 ft. Then new columns were set in place on previously prepared footings, and the job except for the trimmings, was done.

The jacking-up process was the most important part of the operation. After everything was securely set up, hydraulic jacks were set under the girders at selected points, connected to a master hydraulic pump, and the section was lifted, roof and all.

When the jacks had completed their lift, the structure was shored up with heavy wooden timbers. The jacks were then set again and the operation was repeated. When the floor, carrying the roof, had reached the proper height, all that remained to be done was set supporting steel columns under it, build a wall at the open ends, and there it was, a mezzanine floor already roofed. No figures are available, but there was a substantial savings of time, money and material.

This job adds another interesting chapter to the story of the Chevrolet-Tarrytown plant and its long connection with the automobile industry. The main building of the original Tarrytown group was built on the bank of the Hudson River in 1898 and used by John Brisbane Walker to build the Walker steamer. In 1904 the Maxwell-Briscoe Corp. took over the plant to manufacture Maxwell cars. In 1915 Chevrolet purchased the plant which has since undergone several expansions.

Another interesting bit of construction work was done in 1927. In order to complete a planned expansion it was necessary to fill in a small bay which separated the buildings. Barges were sunk to form a bulkhead in the river and sand was pumped in behind them. This created about 10 a of land, on which a modern assembly plant was built in 1929. When the war ended a great deal of reconversion was necessary before the plant could be returned to peacetime operation. Raising of the roof was one of these jobs.

**Fig. 1. Left: Step No. 1 in the construction of the mezzanine. Steel work for the new floor laid out on the ground and fastened together, with the old roof columns attached, all ready to start the jacking operation for the 15 ft raise**

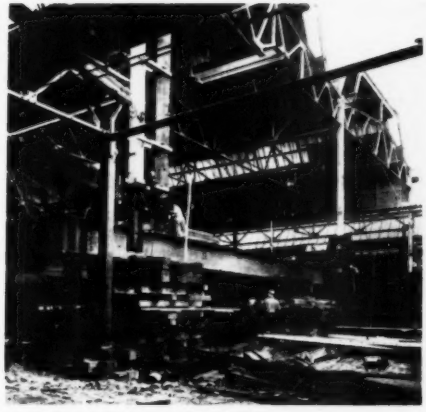


**Fig. 2. Step No. 2. One section part way up and resting on cribbing while the jacks are reset. Note the old roof column which goes up with the structure**

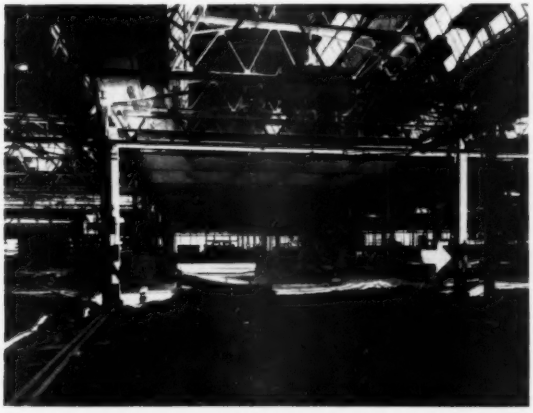


**Fig. 3. Step No. 3. A completed section raised 15 ft and the framework in place. Note the new columns which support the completed structure and rest on the previously prepared footings**

# INDUSTRIAL FENCING

## Selection, Installation, Maintenance

**Selection of proper plant protective fencing starts with a study of property ground limits . . . Types and characteristics of industrial fencing . . . Things to consider when selecting fencing . . . Layout of fence and gates . . . What makes a good gate good? . . . Maintenance**

By P. F. CUTTINO, Anchor Post Fence Div., of Anchor Post Products, Inc.

IT IS GENERALLY recognized that a protective fence is as much a part of an industrial plant as the buildings themselves. In fact, the selection of the proper size, type and location of a protective fence, in the planning of a new plant, requires as much care and study as that required to properly locate streets and driveways in relationship to railroad sidings and truck loading platforms. It demands careful attention if maximum plant protection at minimum dollar outlay is to be provided.

Experience has taught us that though each job is different every one has the following basic problems: 1. Height of fence (to suit contour of property. 2. Type (barbed or non-barbed wire). 3. Location of gates (to provide easy accessibility). 4. Type and size of gate openings.

Therefore, in the initial planning, the selection of fencing starts with a careful study of the property ground limits and building locations to determine what type of fence is required to permit maximum use of property and still provide full protection. For example, a 3-strand barbed wire top fence might be required on the outside perimeter of the grounds but individual buildings and right-of-ways within the grounds would require only the minimum of fence to prevent accidents due to carelessness and short cutting.

In general, the most popular industrial fences today are in heights of 7 ft 0 in. and 8 ft 0 in. without top rail, using chain link fabric with a 2 in. mesh of No. 9 or 6 ga wire or 6 ft 0 in. and 7 ft 0 in. height chain link fence, with a 2 in. mesh of No. 9 or 6 ga wire, with 3 strands of barbed wire mounted on pressed steel arms, extending 1 ft above the fabric proper. In most cases these barbed wire extension arms are made to extend inward at a 45 deg angle, thus allowing the fence itself to be placed on or near the property line. There are times, however, when it is desirable to have the barbed wire extend to the outside of the property, or even conditions that require the barbed wire and arms to be vertical. For appearance, a top rail may be furnished to be placed along or near the top of the chain link fabric. Actually, this top rail does not add to the strength of the fence or its protective purpose. In fact, the most protective fence is one without a top rail since there is nothing to furnish a hand hold to anyone trying to scale it. On the other hand, the recommended non-toprail protective fence utilizes a No. 7 coiled spring wire that is strung along the top of the chain link fabric and clipped to it; provides strength to eliminate fabric sagging, does not detract from fabric appearances, and offers no hand holds for would be trespassers.

### Selection of Posts

Another very important item in selecting a fence for long-lived service and protection is line posts. Under present conditions the best line post, for general industrial use, is a 4 lb per foot H-beam, set on 10 ft centers, sunk at least 3 ft 0 in. into the ground and held in position either by drive-anchors or concrete. This type of line post gives perfect rigidity and is self draining to resist weather corrosion.

In addition, the purchaser of an industrial fence requires knowledge of the manufacturing process. For example, an uncoated fence may, when new, have the same appear-

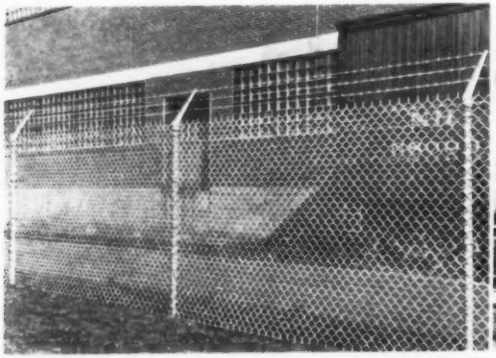


**Fig. 1. This is one of the popular types of plant fencing. Note the three-strand barbed wire top on the horizontal arms extending inside the fence. There is no top bar on this fence inasmuch as it adds little or no strength to the fence and gives unwanted intruders an opportune handhold**

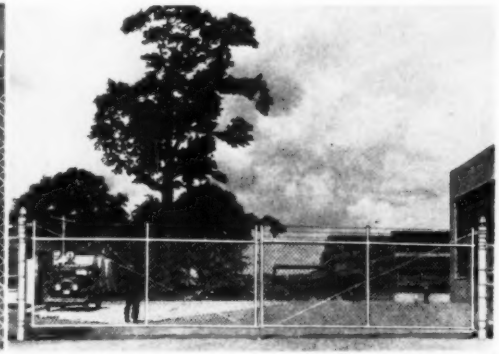


**Fig. 2. This type of gate has an upward-pointing vertical arm holding the three strands of barbed wire. Gates should be so located that they are permitted a full 180 deg swing. Gate widths are governed by widths of vehicles passing through them and by surrounding conditions**

ance as a coated fence but its life is very limited. A good chain link fence should have all its component parts, with the exception of barbed or coiled spring wire, galvanized *after fabrication* with at least a 1.6 oz coating of zinc per square foot of material surface. This galvanizing *after fabrication* insures maximum life by assuring an even zinc coating. If a premium quality fence is required because of unusual weather or plants producing corrosive fumes a special chain link fabric is available with a practically *pure zinc coating* that through thickness and chemical purity of coating offers untold resistance to corrosion.

### Layout of Fence

After this preliminary survey has been made, and the type and height of fence has been tentatively decided upon . . . the real work begins. Now comes the layout of the fencing and the location of gates to provide full accessibility to plant and still protect the plant from unwanted trespassers. Utmost care should be taken here not only in locating the gates but insuring the locations of obtaining the right gate for the purpose desired. In most cases double or single swing type gates can be used most effectively, however, there are special problems and conditions where overhead or cantilever type slide gates are required. In any case the present and anticipated needs of a particular gate location must be taken into consideration to avoid expensive modifications in later years. For example, the size of a gate opening not only depends on the width and size of trucks that enter the property, but also on the location of the driveways and its approach, as well as the distance of the gates from the main thoroughfare. A short approach may necessitate off-setting the gates to readily handle the incoming and outgoing traffic. Dependent uopn the use of these gates is their method of operation. A gate of normal size and usage would be manually operated but a heavy traffic gate might require mechanical or automatic operation in order to efficiently handle traffic and maintain protection.

### Fencing Maintenance

Here again is another point where a working knowledge of fence construction is desirable. A gate receives more wear, takes a heavier beating, than any other component part of an industrial fence. A well constructed and erected gate is needed to facilitate the control of traffic and still give complete protection to the plant.

We have found that gate frames should be made of not less than 2 in. material securely welded at all corners. Gates should be hinged (in the case of swing gates) to open, where possible, to a full 180 deg and thus place the gate in an open position back against the fence and out of danger of being damaged by trucks. In all cases, gate posts should be of ample size and strength to support the varied gate sizes.

A good industrial fence should not require a great deal of maintenance work. Maintenance should not be overlooked, either. Periodically it should be inspected for external object damage or deterioration due to rust or corrosive fume action and corrective action taken. Vines should never be allowed to grow on the fence. They may add to its appearance, in your estimation, but they also hasten rusting by always holding moisture in contact with the fence fabric. Cinders should never be piled against a fence. The chemicals contained in them will prove to be very detrimental to the life of the fence. Likewise, trash should never be burned against the fence because the intense heat tends to melt the protective coating. Little things, perhaps, but they make a great difference in lengthening the life of your fencing dollar investment.

Where a fence has been up for many years and shows signs of rust, it is important that the proper steps be taken to preserve the life of the fence. There are two steps that can be taken to put this fence back in good condition. One is a good coat of paint over the entire job and the other is to paint the framework, which is a very minor job, and replace the chain link fabric and barbed wire with new wire. When this latter step is taken it becomes, for all practical purposes, a new fence, with new strength, ready and able to protect your plant for many years to come.

# Movable Lighting in This Plant

**Contributed by National Electric Products Co.**

A LIGHTING system where flucrescent lighting fixtures can occasionally be changed without extensive cost or construction work is installed in the hosiery mill of Holeproof Hosiery Co., Marietta, Ga. Part of the reason for such a system is based on the planned use of movable tables needed in the matching and inspecting of men's socks after manufacture. It was thought wise to move tables, and lighting fixtures, to meet radical changes in production schedules.

The installation consists of nearly 5000 ft of Surfaceduct. On this steel raceway special hangers were mounted to receive the chain hooks from the lighting fixtures. Through and in the raceway were placed the necessary wiring and duplex outlet receptacles. Thus, on raceway not only protects and distributes electrical conductors, but also serves as a fixture hanger. New receptacles can be easily installed in the raceway and mounting hangers in new locations takes only a few minutes.

**A network of surface raceways suspended from roof trusses is serving double duty in the new finishing plant of Holeproof Hosiery Co., Marietta, Ga.**

# A Louvered Ceiling for MORE LIGHT, LESS GLARE

**This new product, designed for offices, plants with light manufacturing and assembly operations, laboratories and similar locations, permits increased lighting without increased glare . . . Improves appearances—conceals ceiling pipes, sprinkler systems, bare lighting fixtures, unfinished ceilings . . . Reduces ceiling construction costs, eliminates lathing, plastering**

**Plant Engineering**
*Product Application Feature*

THE NEW PRODUCT described and illustrated on these pages is not a source of lighting, but it is a contribution to the science of good lighting. So constructed that it cuts off glare below an angle of 45 deg, it greatly reduces the possibility of eye strain because the eye level rarely lifts above that point.

Essentially this new louvered ceiling, called Cell-Ceil by its makers, is a ceiling treatment which conceals overhead sprinkler systems without reducing their efficiency, hides old or unused lighting outlets, obviates the use of expensive air conditioning grilles and improves the air stream diffusion.

### Reduction in Costs

Reduction in construction costs is also cited as one benefit from its use. It greatly reduces ceiling construction costs since several expensive operations such as lathing and plastering may be eliminated. Combinations of various sizes of standard panels will fit any area and they have the advantage of presenting the appearance of one continuous section.

Cell-Ceil greatly increases the permissible amount of illumination which can safely be used. Like any lamp shade, glass lens or louver through which a light is directed, there is a certain percentage of absorption. Where a minimum number of foot candles is desired at the working levels the light source intensity should be about 25 per cent greater than if bare fixtures were used. Intensities in excess of 200 foot candles are so handled without discomfort or undue ceiling brightness.

Panel requirements depend on size of area to be covered, shape of area and obstructions in that area. The panels are available in two widths—24 and 30 in. Either width is available in panel lengths which vary by 6 in. steps from 96 in. down to 12 in. Size, shape and obstructions will, therefore, determine the number and sizes of panels necessary. As shown in Fig. 3 panels of either width may be set side by side indiscriminately with no visible line of separation. The direction in which the panels are to be run may be predetermined by the position of the lighting equipment.

Not all rooms, in fact very few, will be found to be exact multiples of 6 in. The best installation practice, however, calls for a 3 to 6 in. clearance between the Cell-Ceil and the walls on all sides. Thus, the area of the room should be reduced by any number of odd inches to bring the length of the panels to some even 6 in. multiple. As an example, a room measuring 15 ft 3 in. in length should be considered as 14 ft 6 in., thus allowing 4½ in. at each end.

Having determined the length of the panels you know how many are required to reach the length of the room. This also shows how many hanging rails are necessary since a rail is required at each end of each panel. The next step is to determine how many panels of either or both widths are needed to cover the width of the room. First, measure the width. Allow the 3 in. to 6 in. for clearance at the walls and also to give you a width dimension which is a 6 in. multiple. Divide this figure by 30 in. If it doesn't come out evenly substitute 24 in. panels for some of the 30 in. until it does. Panels of either width can be intermixed and still present an unbroken appearance. The finished layout may look something like Fig. 3.

In order to determine how many feet of hanging rail are required just multiply twice the number of panels along the length of the room by the total width of panels along the width of the room and you have the total feet of hanging rail required.

### How to Install the Ceiling

The light weight panels are suspended through the medium of hanging rails and accessories, by 18 ga wire attached to the ceiling. The wires may be fastened to the ceiling with small screw-eyes, toggle bolts or other means. The manufacturer

**Fig. 1. A startling comparison is shown in this before-and-after photograph. Rooms at left are poorly lighted with six 300 watt lamps with a total of from 7 to 9 foot candles in each room; the rooms at the right with louvered ceilings are lighted with Slimline lamps which have a total of 2200 watts producing 45 to 50 foot candles in each room**

Readers interested in obtaining the name of the manufacturer of this new louvered ceiling may have it by writing The Editors, PLANT ENGINEERING, 35 W. Jackson Blvd., Chicago 4, Ill. To make it easier, just use the postage-paid card which appears at pages 18 or 88.

of the Cell-Ceil furnishes the material necessary for hanging the ceiling. This includes hanging rails, hooks, nuts, bolts, clips and sufficient wire to suspend the material 18 in. below the ceiling. Four simple tools are required: screwdriver, pliers, hacksaw and level.

• • •

**Step 1—First, prepare the rails for hanging.** Their length and location can be determined from the layout drawing such as Fig. 3. Hanging rail is a special lightweight, slotted angle iron, furnished in 10 ft lengths. There are two kinds of hanging rail: "terminal" and "intermediate." Terminal rail is used only to hang the outer ends of the panels as illustrated in Fig. 4. Intermediate rail consists of two terminal rails bolted together to form an inverted "U" channel as shown in Fig. 5.

Splices in the terminal rail may be made, Fig. 4, by butting two lengths together and bolting a third, short piece of rail to the joint. Splices in the terminal rail are made by staggering the joints when bolting the two angles together as shown in Fig. 4.

When the rail is being laid out, the L-clips should be attached at intervals of approximately 3 ft. The suspension wire will be attached to these clips.

• • •

**Step 2—Suspending the rails.** The hanging rail, now cut and laid out, will determine the location of the ceiling attachments. After these have been installed the hanging wires should be attached to them and the hanging rails, in turn, attached to the wires. After making necessary adjustments the clips should be tightened and the splices completed.

• • •

**Step 3—Leveling the rails.** The proper height of suspension can now be accurately determined and all the rails may be leveled. The proper height of the rails is 5 in. above the bottom level of the Cell-Ceil. Cross-leveling is necessary, East and West as well as North and South. Final adjustments can be made as panels are being installed.

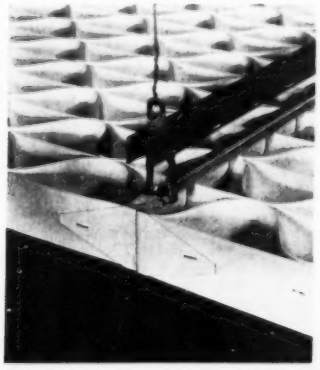


Fig. 2. This close-up shows details of construction of the Cell-Ceil and method of hanging

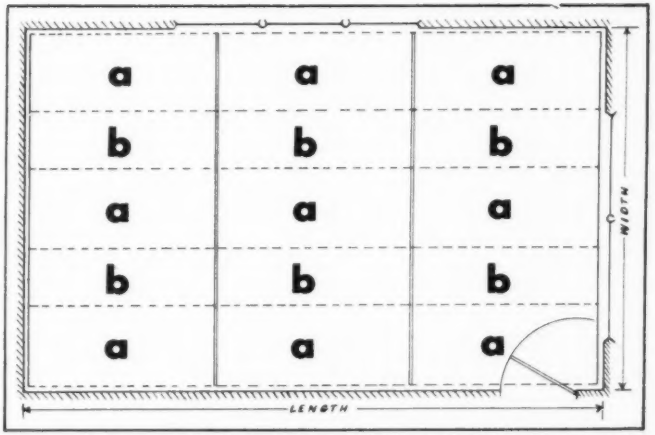



Fig. 3. This is an example of room layout for the louvered ceiling. The area to be covered is 11½ ft by 19½ ft or 224¼ sq ft. Single line at the ends indicates the terminal rail; double line the intermediate rail; dash line indicates panel widths. Panels marked "a" are 78 in. long by 30 in. wide; panels marked "b" are 78 in. long by 24 in. wide

• • •

**Step 4—Attaching Hooks.** Prior to the final operation of hanging the panels it is necessary to hang the hooks from which the panels are suspended. Starting with the first hole, insert the hooks, round end up, in the hanging rails. Pinch these ends shut with a pair of large pliers. Hooks should be placed in the rail to provide two hooks per panel. Receiving slots in the end caps of the panels are 1½ in. from each side and are arranged as shown in Figs. 5 and 6. This means adjacent panels will have hooks 3 in. apart. In a 24 in. panel, hooks are 21 in. apart; they are 27 in. apart in a 30 in. panel.

• • •

**Step 5—Attaching Panels.** Panels now may be hung on the hooks as shown in Figs. 2 and 6. All areas, whether square or rectangular; may be readily handled. Some areas, having an irregular shape may be finished by first erecting a small shelf around the room. Then, with an ordinary pair of tin snips, the required louver panels can be cut to shape and fitted partly on the shelf with the other ends on a hook rail. It can be noted on Fig. 7 that the shelf is mounted on small blocks of wood. These are spaced about every 24 in. and they serve to permit light to slide down the wall thus preventing a dark, uninviting shadow to form directly under the shelf.

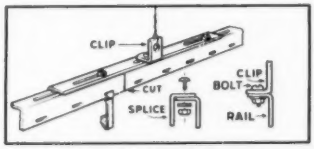



Fig. 4. Method of making splices in terminal rail are shown in this drawing

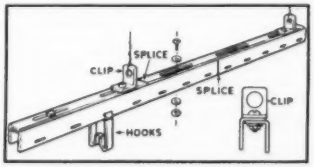



Fig. 5. Intermediate rail consists of two terminal rails bolted together to form an inverted "U" channel

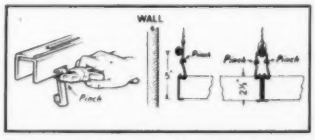



Fig. 6. Method of attaching hooks to rails is shown in this drawing

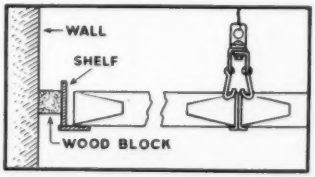



Fig. 7. For shelf-mounting of irregular shapes use small blocks of wood about every 24 in.

# FUSES—Proper Installation, Testing and Maintenance

**Value of time and production lost when fuses blow is extremely high . . . Case histories . . . How fuses operate . . . Testing for loose clips or contacts . . . Causes of loose contacts . . . Branch circuit fusing . . . Hazards of unauthorized tampering . . . Foolproof types of fuses and protection against tampering . . . Main fuses—the final link in protection . . . Requirements of National Electrical Code . . . Proper location is important . . . Testing load conditions . . . Types of fuses**

By **HOWARD PODELL,**
**Electrical Engineer**

A STRIKING example of the importance of problems of maintenance engineering in plants is found in the use of fuses on production equipment and industrial lighting.

The high cost of fuse blowout in terms of lost time and materials is generally out of all proportion to the nominal cost of the fuse itself. Some examples may be of interest.

### Blowouts Cost Money

The engineer of a rubber factory in New Jersey estimated that each blown fuse on his conveyor equipment represented a loss of $250 in operating expenses. This extremely high figure was arrived at by checking the time necessary to clean dried rubber from the line after each shutdown and multiplying it by the hourly wages of the idle employees. It also included the cost of the wasted material.

On unit operations, the cost of shutdowns is lower, but does not generally fall below $5 and averages about $12 per fuse replacement. Time is lost in notifying the electrician and in his checking the cause of the shutdown; as much as twenty minutes or more may elapse before the circuit is restored.

The large percentage of industrial fuse blowouts are unnecessary; most of them can be readily prevented by the application of a few simple principles.

Overheating of fuses may be caused by loose fuse clips. More frequently the opposite occurs; overheated fuses loosen the fuse clips by removing their spring temper. This is particularly true in enclosed fuse cutouts and boxes where heat from defective fuses builds up readily.

The action of fuses can be easily understood in terms of heat flow. The heat generated inside the fuse flows out through the same path as the electricity, to the copper cables or bus bars. When the heat generated inside the fuse becomes greater that the amount that can flow out, its temperature rises and the fuse blows.

In normal operation and with tight inside and outside fuse contacts, there is sufficient pathway for the heat to flow out of the fuse as fast as it is generated. Normally, as the fuse temperature rises, the heat flows out of the fuse faster because of the temperature gradient and the fuse carries its full rated load and also temporary overloads.

A loose contact inside the fuse, or at the fuse clips, creates an impedance to the outward flow of the heat. At the same time, the loose contact creates heat of its own. The twofold nature of contact resistance not only prevents heat from flowing out of the fuse, but creates additional heat as well.

### Loose Clip or Contact

A reliable indication of contact resistance is given by the charring of the fuse casing. This charring is produced by the heat of a loose contact. To determine whether the fuse clips, or the internal fuse contacts are loose, try the following simple test. A fuse which is hotter at one terminal than the other should be reversed, end-over-end.

After a brief wait, inspection will reveal the source of contact resistance. Should the same fuse clip remain hottest, the clip is at fault. Should the opposite clip be hotter, the loose contact can be traced to the internal connection inside the fuse.

Photo: Star Fuse Co.

**Fig. 1. Combination fuse pullers and circuit testers of the type shown here are a versatile and useful tool**

Another way to determine the excessive heating is by use of a millivoltmeter. A meter ranging from 0 to 0.250 v can be placed in parallel with the fuse, and then in parallel with the fuse clips. The difference in reading is the fuse-to-clip contact resistance. The millivolt drop across a good fuse at rated load should not exceed 0.150v and should be considerably less. Total drop across both clips should not exceed the fuse drop by 50 mv. The meter may be used to measure the IR drop in other parts of the switchbox in checking switch contacts and connections of cable to clips.

Tests with a millivoltmeter should be made, where possible, after the circuit is in use for over an hour and care should be used not to test across opposite polarities.

### Causes of Loose Contacts

Electricians are proud of the tight clean contacts they make when they renew fuses and install them in cutouts. They are surprised to find these contacts loose when the fuse is removed. Why?

Some renewable fuses have a bimetal contact of copper to zinc which is bolted together. Under on-off heating, this contact may loosen up in time. In others, shrinkage of the fiber tubing, as it dries out under heat, results in loosening up the contacts. In replacing fuses, sometimes the copper or brass bolt or washer is mislaid and an iron one substituted, creating more resistance to the path of heat. A frequent violation is the use of the link of one manufacturer in the fuse of another. All fuse manufacturers warn against this practice.

But the answer to the problems of unnecessary blowouts and failures of fuses under rated loads lies also in the location of the fuse box and the condition of the load. Load conditions can be broken into two categories—branch circuits and main circuits.

### Branch Circuit Fusing

The branch circuit fuse is the first link of electrical protection, and the most important in safety. It primarily protects the wiring and personnel by limiting the value of short circuit currents. We know that the destructiveness of a short circuit is based on the time required to open the circuit, as oscillograph studies have shown that on a dead short, the current builds up from zero to a peak in a few fractions of a second. The short circuit currents of a fuse can be as much as ten times the rating of the fuse, depending on the resistance of the supply lines. The smaller the fuse rating, the sooner it opens on a short and consequently both current and destructive arc wattage are limited by the smallest size fuse.

The "doubling up" of fuses by using two or more fuse links, when the fuse is not designed for such practice, is far more dangerous than it appears.

The "doubled up" fuse is not a fuse with twice the rating; it is no longer of protection at all on short circuits. To carry the short circuit arc with a 60 amp link, the standard 60 amp fuse is 3 in. long or 50 per cent longer than the 30 amp fuse. When two 30 amp links are put in the 2 in. 30 amp ferrule, the heavier arc produced on a short circuit may jump across the fuse caps, creating a fire or explosion. On the other hand, the "doubled-up" fuse does not carry appreciable overload currents of any duration since the internal contact area has not been increased. The result on prolonged overloads is the charring of the fuse case due to the contact resistance.

The hazard represented by "doubled-up" fuses is undoubtedly one of the greatest factors in the cause of electrical fires. For lighting loads, authorities recommend that branch circuit fuses of 15 amp or less be used. Shorts on these lines occur frequently in portable cords and lamps. Since safety of personnel is most important, a quick acting fuse is desired to limit the short circuit current. Lighting loads have a momentary high inrush current, and it may be necessary to link the lamp circuits so that only small groups are switched on at one time. It will be found that fluorescent lamps will light quicker and both lamps and their starters will last longer when lighted in small groups. Lamps and motors should be fused independently wherever possible as different operating characteristics prevail.

Small motors can be independently protected for overloads by built-in thermal devices or by special time delay fuses. Small a-c motors, without starter relays, start with as high as 600 per cent of their running current, and the standard branch fuse which will carry the starting current will not protect the motor on overload. The special fuses

Photo: General Electric Co.

**Fig. 2. One of the most convenient methods of testing loads on fuses is by means of the hook-on ammeter**

for small motors are best located in or near the starting panel of the motor.

### Main Fuses

The main fuses are the final link in protection. Since the branch circuits are separately fused, there is no good reason to expect blowout on the main circuits. Yet the frequency with which they occur is surprising. In older installations the fault is usually laid to the additional branch circuits added to the feeders. But, not infrequently, the main fuses blow well below the rated load.

Main fuses on lighting circuits reach their peak currents on cloudy days and at dusk. Load inspection should be made at those times with an ammeter which will generally reveal that one phase is carrying more current than the other phases. In practice, the lighting loads are taken off separately between each phase and the ground, and a balance on those circuits is impossible. Where sufficient unbalance is found to raise the current on any one phase above the rating of the main fuse, it is desirable to rearrange some of the branch circuits, adding to the unloaded phases and removing from the highly loaded phase. Requirements of the National Electrical Code should be followed in this respect which require the main fuse to equal the total rating of all the branch fuses, in some cases and allow a demand factor in other cases (NEC #2203).

Because branch circuit fuses are convenient to personnel, and to the public, the boxes should be securely locked. Frequently, branch circuits are overloaded by the addition of heaters, and the fuses are "doubled up" or otherwise tampered with. A small heater for making coffee will carry more than 6 amp and one or two of these added to the existing branch load will easily overload such circuits. If a larger fuse has to be put in such a circuit, it is preferable for the plant engineer to be aware of the situation, than to have indiscriminate overfusing. In many cases it is possible for him to suggest using outlets on circuits which are not loaded, or to rearrange the existing circuits. It is not unusual in offices, hospitals, or hotels for personnel to bring in outside appliances and only proper fusing will prevent injuries if a short circuit occurs in their use. Radios, heaters, electric razors, etc. belong in this category. Other frequent causes of branch circuit overloading lies in the use of larger lamps and additional wiring onto existing branches.

On power circuits, the blowing of one of the main fuses, frequently results in the blowing of some of the branch circuit fuses on three phase circuits, and all branch circuit motor fuses should be inspected after restoring service to the feeder.

Main fuses are generally located in unventilated areas and near boiler rooms where the heat builds up in the fuse. Ventilation of the fuse box area cannot be too highly recommended because the fuse rating applies to room temperatures of a maximum of 30 C or 86 F. Higher ambient temperatures reduce the fuse ratings proportionately and are a prime factor of unnecessary blowouts. Extreme cases of ambient heat call for relocation of the fuse box. In a recent case that came to the writer's attention, the fuse box was located directly under the steam line and 900 amp fuses were blowing on a 300 amp load. By forced ventilation and use of tight fuses, it was possible to use 400 amp fuses in this box, and so again protect the feeders. The previous use of 900 amp fuse links (3-300 amp links) in a 400 amp fuse casing had not prevented the fuse from blowing, but

(*Continued on page 50*)

## Huge Vacuum Cleaner Helps Akron Breathe

**Contributed by The W. W. Sly Mfg. Co.**

AT THE QUAKER OATS CO. plant in Akron, Ohio, there are several processes which create dust—always an annoyance to employees and plant neighbors. Grain is conveyed by air for a considerable distance, from storage bins to a processing building; grain is passed through cleaning machines; grain is ground into feed by high speed hammermills.

The dust created by these operations is sucked away by high-speed fans, and most of it is accumulated in so-called cyclone collectors. The very fine dust which these collectors do not catch has been a nuisance around the factory neighborhood.

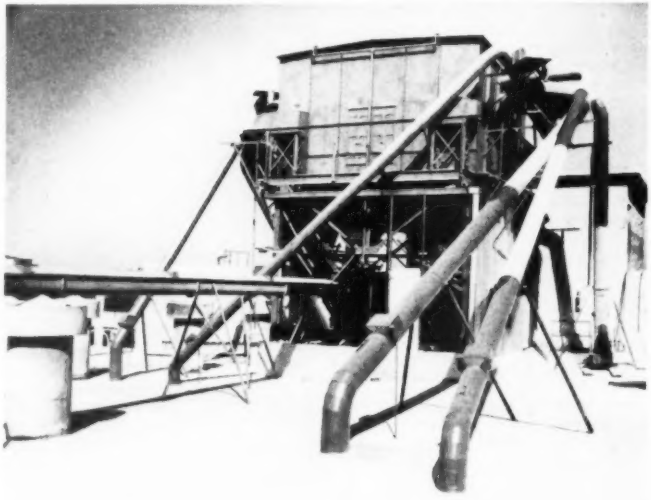
To catch this fine dust, and thereby eliminate a troublesome element, our company has designed and installed a dust filter, shown in the illustration, which was put in operation recently. The filter is located on top of the seven-story factory building.

The outlets to a total of seven cyclone collectors are connected to this filter. Its size is based on the total amount of air, 27,000 cfm, which is exhausted from the conveyors, the grain cleaners, and the hammermills.

The dust filter operates on the principle of a vacuum cleaner, using hundreds of cloth bags instead of a single bag. The dust-laden air is sucked into the filter; dust deposits on the bags, and the discharged air is clean and free from dust.

The entire unit is automatic in operation. An electric timer operates cleaning devices, which periodically shake the dust off the filter bags into hoppers, from which it is conveyed to a point of disposal. The system is operated continuously for 24 hr a day.

When any one of the conveyors, cleaners, or hammermills is shut down, the suction valve on this machine closes automatically and another valve at the dust filter opens to let in an equivalent amount of air; thus the system continues operation at full capacity.



**Roof installation of Sly dust filter; unit is automatic in operation and is periodically cleaned by an electrically-timed device**

# Standing Orders for the Plant Fire Brigade

**This short article reproduces the standing orders which have been issued by the plant engineer at this company to guide the conduct of the Fire Brigade at all times . . . Emphasis is always placed upon realities . . . Teamwork has been made standard operating procedure**

**By W. H. FISCHER, Plant Engineer, Underwood Corporation**

THE CHIEF, or First Assistant Chief will be in general supervision at all fires. Either he personally, or by directions, will sound the recall as soon as the fire is under control or drill is over. This should be as soon as possible as many people in the plant are anxious to know when the danger point has been passed.

The First Assistant will have charge of operation of trucks and laying out of hose. He should dispatch immediately two men to bring second truck to floor below or floor above, depending upon where fire is located. At the same time, dispatching another team for the laying of the 2½ in. line to the nearest riser with the 2½ in. to 1½ in. Siamese valve connection to which additional 1½ in. hose can be laid without water as a reserve. This to be used in case sprinkler shutoff is used, and the original 1½ in. hose is cut off. At this time, it should be emphasized, the proper hose connection originally made is to be quite some distance from the fire, so that in case a sprinkler is involved, and shut off, it will not cut the first line of water.

The Second Assistant is in charge of all sprinkler controls. His will be a job to see that the sprinkler is shut off as soon as truck arrives, and water is turned on. This sprinkler head should be replaced from spares carried in trucks.

The Third Assistant is to be in charge of all salvage trucks, and covers. His will be the responsibility to see that salvage truck arrives in time, in response to the alarm, and that sufficient covers are taken to the floor below to cover all machines and parts, and to protect from water damage.

The Guard office will provide two guards whose job it will be to clear the way for all firemen at the fire, and trucks enroute in answer to the alarm. All persons must be removed from the area where firemen are working. No one is to be permitted to stand in doorways, or in any way hinder the operation of hose or extinguishers.

In answer to all alarms, guard will be dispatched to Woodbine St. with keys for Woodbine St. Indicator Posts (under lock and key) to shut off sprinkler.

It is recommended that two men be trained in the operation and use of the salvage truck. This will require that these men learn how to spread covers properly and to see that the covers do not become torn.

All men, foremen and assistant chiefs are expected to answer all alarms. Fire extinguishers are to be used wherever conditions warrant; such as small fires. Extinguishers will do the job rather than putting on fog nozzle which may create water damage on floor below.

*All alarms must be considered serious business.* They are either a call for drill, or a call for a real fire. In either case, it must be given instant consideration.

A fire that can be seen should not be feared. Smoke is generated from fires, and concern should be registered when fire cannot be seen.

When an alarm sounds, truck on that floor will go directly to the fire. The truck on the floor above, or below, as the case may be, will be sent for as soon as the first line of hose is laid. First line of hose to be used from the truck at fire.

All members of the Fire Brigade should get in the habit of taking notes and making suggestions as they go through the plant, when they they see things which they know from past training may lead to a fire. Instant checking will result in good housekeeping. Good housekeeping will safeguard the factory.

"Can't you just say you don't like it, Mr. Cornish?"

# RATS—and How to Control Them in Industry

**Characteristics and habits of rodents . . . Elimination of food and shelter . . . Ratproofing in new and old structures . . . Poisoning, test baiting and pre-baiting . . . Various types of poison baits and methods of preparation . . . Trapping and fumigation and attendant dangers**

By **ALVIN R. JACOBSON**, Asst. Professor of Sanitary Chemistry, New York University

ACCORDING TO A recent estimate, rodents do $2,000,000,000 damage annually throughout the nation. They contaminate food stocks, destroy clothing and other supplies, damage buildings and equipment and gnaw the insulation from electrical connections thereby causing large losses by fire. Rodents also are reservoirs of infection for endemic typhus, plague, jaundice and tularemia.

The plant engineer is interested in this problem because he wants to determine how serious it is in his particular plant and also what steps are necessary to greatly reduce or entirely eliminate the rodents from the plant area.

The purpose of this article is to briefly survey the various methods of ratproofing old structures and to include plans or specifications for ratproofing in new plant construction. A brief description of the various types of rodenticides and their methods of use and effectiveness is also included. Measures of safety for the proper handling of rodenticides and other poisons are given.

## Habits of Rodents

As a knowledge of the species involved and their habits is advantageous for an effective rodent control program, a brief outline presenting these facts is given below:

**Rats**—Rats usually travel and feed at night and are great travelers in their efforts to forage for food. The Brown or Norway rat is a burrowing animal having great gnawing ability and may be found in basements and on lower floors of buildings. Black and roof rats being good climbers are found in clumps of vines, trees or attics of buildings. All rats are omnivorous feeders, the brown rat preferring meats and fish while the black and roof rats eat fruits and vegetables. Both kinds do considerable damage to papers and cloth. Locations affording shelter and food for rats may usually be found around lumber piles, near trash and garbage racks, storerooms, warehouses and unoccupied buildings.

**Mice**—House mice often nest in stored clothing, paper, or other materials and in the preparation of their nests damage is done by the gnawing of fabrics. There are also two outdoor species of mice which do considerable damage, namely the white-footed mouse and the meadow mouse.

**Ground Squirrels**—Ground squirrels may damage the grounds in the plant area by raising mounds of earth around the burrows thereby making the surface rough and sometimes causing destruction to vegetation.

**Pocket Gophers**—Pocket gophers are small and chunky, having fur-lined cheek pouches opening outside the mouth. They are seldom seen but are very active constructing underground burrows which usually range from 4 to 8 in. deep and at times even 6 ft deep. The gophers cut plant roots, cover grasses with mounds of earth and seriously undermine the ground surface.

**Moles**—Moles usually live on insects but occasionally cut bulbs and roots. Their burrows may destroy turf by aeration and drying of roots.

Rats are the most destructive of the rodents and therefore of greatest economic importance to the plant engineer. Because of the necessity of relating as much pertinent information as possible in an article of this length, it was thought best to cover the control methods peculiar to rats. By slight variations in these methods they are applicable in most cases to the above rodents.

## Control Methods

An effective rodent control program should consist of one or more of the following methods: Elimination of food and shelter; ratproofing of buildings; poisoning; trapping, and fumigation.

Photograph courtesy Monsanto Chemical Co.

**Fig. 1. Preparation of poison baits must be done by skilled workmen or regular employees who have been trained in extermination methods. Many of the new rodenticides are so lethal that they are sold only to experienced exterminators**

Photograph courtesy West Disinfecting Co.

**Fig. 2. Public health officials are always ready to cooperate with plant engineering staffs in any rodent control program**

Rats are difficult to eradicate because they are cunning, wary and intelligent and also because they breed prolifically, having 4 to 6 litters per year and 10 or 12 young per litter. While complete extermination is almost impossible, it has been found that more satisfactory results usually will be obtained if a well-planned method of suppression is inaugurated.

**Elimination of food and shelter**—The removal of food and shelter is one of the first steps toward permanent control. Prompt and proper disposal of garbage is essential to eliminate it as a source of food. All stored foods should be handled properly and elevated on ratproof dunnage. This may be done by building platforms with legs 14 in. high covered with tin to prevent rats and mice crawling onto the stored food. It is also essential to place the stored material at least 2 ft away from the wall. All other garbage and trash should be disposed of daily. Open dump grounds should be eliminated because of the possibility of an infestation by rats. The ideal type of refuse and garbage disposal is the sanitary fill.

**Ratproofing**—Ratproofing is eliminating the hiding and nesting places of rats, preventing them from foraging for their food, and in general excluding them from the buildings, either old or new.

**1. New Structures**—In the construction of new buildings, plans and specifications should be included for their ratproofing. External construction of buildings should be of materials that are resistant to rat gnawing, preferably brick or 1:2:3 concrete. The walls should be continuous around the entire building and the doors and grating should be covered with galvanized metal or 20 ga hardware cloth to a height of 10 in. Doors should be self-closing and tight fitting. Openings around boxed-in piping conduits or other objects entering the walls should be closed with an impervious material. This impervious material should be a 1:2 cement mixture if the opening is to be permanently closed, or a metal collar could be provided and securely fastened with screws to the wall, making it possible for its removal if the necessity arose at some future time. Fire stops in double walls should exclude rats. Ventilators and louvers should be covered with galvanized metal or 20 ga hardware cloth, with mesh not to exceed ¼ in. All other openings should be covered in like manner to prevent the entrance of rats to the building.

**2. Old Structures**—In setting up a permanent ratproofing program it is important to keep in mind two general principles: 1 Prevention of rats from entering the buildings, i.e., the exterior walls should be closely examined for openings which allow the entrance of rats; 2 Dead space should not be provided in the plant for the safe harboring of rats.

All old structures should be closely examined for openings between the outside and inside walls or between the floors. These openings between the studs should be closed by means of wood stops, 2 ft by 4 ft timbers or thicker; cement and cinder stops; broken bricks or cement blocks. All other requisites for doors and openings are the same as those cited under "new structures."

To prevent rat harborage in the wooden floors they should be flashed with 24 ga metal or hardware cloth 8 in. wide with the edges securely fastened to the floor and wall. The same method of flashing should be used to prevent rats from inhabiting the ceilings.

Where it is feasible to employ permanent control measures for the suppression of the rat population, they should be carried out. Along with these methods of ratproofing it is usually very beneficial to include some methods of destruction of the rat population. Where ratproofing may or may not be practiced, continual destruction of the rats may be the only practical method of control.

Poisoning, fumigation and trapping are methods of destruction which if adapted to the local conditions at any particular plant may simplify control.

**Poisoning**—Poisoning of rats is an efficient and most generally recommended method of destruction. However, there are two main objections to the use of poisons, namely, they are toxic to human beings and domestic animals and therefore must be used with all recommended safeguards; and obnoxious odors result from decaying rat bodies after their death in inaccessible places. The first objection can be overcome by using one of the poisons which is more specific for rats or by using one of the milder poisons and exercising proper care in exposing it. The second objection may be practically overcome by using a slow-acting poison, one that will give the rats sufficient time to come out in the open after they have taken poison and become ill.

Poisoning is only effective in rat control if properly planned and supervised. Success in poisoning depends largely upon the types of baits used and the methods of mixing and distributing them.

**Test baiting**—After being certain that all other sources of food are made inaccessible to the rats, test baits are placed in all the regular runways and haunts in the building for several nights to determine which foods are preferred. The test bait should be prepared from three main classes of food: Cereals (bread, oatmeal, cornmeal, chicken mash, etc.); protein and fat (meat, fish, waste cooking grease, peanut but-

ter); and fruits and vegetables (melons, sweet potatoes, bananas, and similar materials). The importance of test baiting cannot be stressed too much. Exercising care in the proper selection, mixing and distribution of baits is usually of more importance than the selection of the poison and usually more difficult.

**Prebaiting**—As soon as the rat has shown a preference for two or three kinds of food, then prebaits are prepared and distributed. It is usually a satisfactory procedure to distribute a large number of small baits (a teaspoonful) so that every rat will be supplied, as will be shown the next morning if some baits are untouched. It is not necessary to protect the baits from contact with the hands as rats are not wary of the scent of man.

**Poison baits**—As soon as it has been decided that the rats are gorging themeslves, then the poisoned baits are distributed having been prepared exactly the same, except with the addition of poison. As has been mentioned previously, the use of several kinds of food is far superior to a single food in the preparation of poisoned baits. A number of the poisons which may be used in the baits are as follows:

**Barium carbonate**—Barium carbonate (precipitated) is a heavy white mineral salt. It is tasteless, odorless, mildly poisonous, slow-acting and inexpensive. Even though it is a comparatively mild poison, it is nevertheless fatal to chickens, dogs, cats, and larger animals if eaten in sufficient quantity.

**Red squill**—Red squill has a distinct advantage of being a poison that is relatively harmless to human beings and domestic animals. It is an emetic, causes vomiting, thereby serving as its own antidote. Rats are unable to vomit so the poison is effective against them. The squill should be purchased from suppliers who will guarantee the toxicity of their product as oftentimes the commercial red squill rat poisons vary considerably in this respect. Rats made sick by a dosage insufficient to kill them will usually refuse further baits containing the red squill poison. This is one of the reasons prebating is particularly desirable.

Red squill may be purchased in either the liquid or powder form. The powder is usually more economical, keeps better, and it can be mixed with a greater variety of baits in a shorter period of time.

Although squill is usually considered a "safe" rat poison, it is not as safe as is commonly advertised. Experience has shown that it can be poisonous to other animals if taken in sufficient quantities. It is therefore recommended that children and domestic animals be prevented from gaining access to this type of poisoned bait.

**Antu (or alpha-naphthyl thiourea)**—One of the newer and more powerful rodenticides is alpha-naphthyl thiourea, Antu being an abbreviated name for this poison. It is a gray powder being almost tasteless and odorless. It is a very toxic poison, one pound of it being sufficient to kill about 300,000 rats based on its lethal dose. Antu has one very favorable feature in that it acts exclusively on rats leaving domestic animals and human beings untouched.

With a complete coverage of every hole, burrow, runway, and harborage in every building in the plant area, it is possible to kill 95 per cent of the rats in 24 to 48 hours, with an adequate supply of poisoned material distributed under the proper conditions as stated previously. It must be used properly the first time as rats will not eat the poisoned baits again if it is not used in killing doses.

**1080 (or Sodium fluoracetate)**—1080 proved the most promising rodenticide of the thousands of compounds which were tested during the war years by the Fish and Wildlife Commission. It is very soluble in water and extremely poisonous which makes the lethal dose almost tasteless, and the material exposed as a water solution has given amazingly thorough results.

1080 is distributed in the usual baitings by the injection of a water solution into meat; 10 grams being sufficient to treat and entire sheep carcass, 80 grams enough for the carcass of a horse.

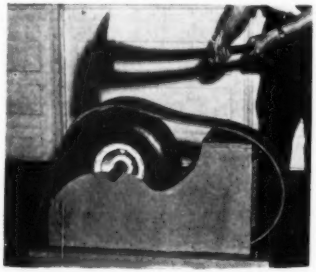
Due to its high toxicity this poison must be distributed so as to be inaccessible to dogs and cats. Its greatest danger is to careless operators as no antidotes have yet been developed to the knowledge of this writer.

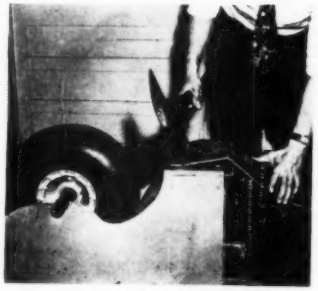
**Trapping as a Means of Suppression**—Trapping rats is an effective indicator of rat population and is a means of suppression. It is often recommended to supplement the baiting program. The wood-base snap trap, circular steel trap, and the box and cage traps are used with or without baits. If baits are used they may include bacon rind, bread dipped in bacon grease, walnuts or fresh cocoanut. If no bait is used, the trigger on the trap is enlarged with a piece of corrugated cardboard to facilitate the rats being caught. Careful attention to detail is necessary as success depends upon skill in locating traps along runways and in places frequented by rats.

**Fumigation**—Fumigation is an effective method of killing all the rats and the fleas that are living on them, the fleas being vectors of plague, endemic typhus, jaundice and tularemia. Specially trained crews should do the fumigation of buildings and rat burrows as hydrogen cyanide (hydrocyanic acid gas) is one of the most effective fumigants btu it is also one of the most dangerous (fatal) if the vapors are taken into the lungs for only a very short period of time. Doses of 5 ounces for 1,000 cu ft will kill all rats and fleas after an exposure period of 4 to 6 hr. Calcium cyanide, a dust, is highly recommended as a rodenticide to be applied to rat burrows with a footpump duster. This powder should not be used in buildings. Another effective method of fumigation is by using hydrogen cyanide (impregnated paper discs). The are used by the United States Public Health Service in the fumigation of boats entering our ports, and are recommended as a building fumigant.

As has been stated previously, a well planned rat control program may be very effective in reducing the annual damage caused by rats. The program may be based on one method, or a combination of several of the above methods, depending upon which are the most applicable to the individual plants or problems in question. In all cases, necessary precautions should be exercised in the execution of these programs.

## Rubber Tire Cushions Conveyor Belts





Photographs Goodyear Tire and Rubber Co.

**The camera caught the rebound of the fireman's ax which was wielded in this demonstration to show how a pneumatic tire absorbs the cutting blow inflicted on a piece of belting. This system has successfully protected belts against the shock of 300 lb boulders falling 12 ft—an impact of 43,000 inch pounds. The second photo shows that a light blow can inflict severe cuts on uncushioned belting**

# Instrument Service—PM or PM*

**Down time is expensive . . . Don't wait for a breakdown, prevent it . . . How preventive maintenance schedules are set up . . . Examples of good practice . . . Cutting instrument failures 80 per cent . . . Maintenance and servicing schedules . . . Instrument and repair records and their use . . . Service codes . . . Using records to improve equipment**

**By C. F. McVOY, Pittsfield Apparatus Dept. Laboratory, General Elec. Co.**

TRUTH OF THE adage that "an ounce of prevention is worth a cure" is convincingly demonstrated by applying preventive maintenance principles to instruments used to control manufacturing operations in any large industrial plant. Because instrumentation has made a great contribution toward increasing production and bettering quality in our manufacturing processes, it has been recognized by a rapid increase in application throughout manufacturing operations.

Today, in substantial degree, productive output is influenced by the performance of the instrumentation employed. It becomes increasingly important, therefore, that instruments so employed give as near fool proof performance as the ingenuity of the designer can deliver and the service engineer can devise.

In this article a program of preventive maintenance applicable to instrument servicing is outlined. Contrasted with the "wait-for-something-to-happen" technique of "post mortem" approach, it has much to be recommended. For example, a potential trouble spot in a process control or special test installation receives necessary attention before a breakdown occurs. This substantially decreases manufacturing shut-downs, delays in assembly, delays in preliminary or final test, or, the production of inferior materials from improper processing.

### Preventive Maintenance vs. Post Mortem Maintenance

The curve, Fig. 1, was plotted from the service records of Pittsfield's Instrument Service Section. The number of instruments serviced is shown for each month during the last half of 1946 and for 1947. The solid line represents the number of "post mortem" calls handled. The dotted line was plotted from the number of instruments serviced on a troubled prevention basis each month. As more and more emphasis was placed on the preventive maintenance program, the "post mortem" calls decreased rapidly.

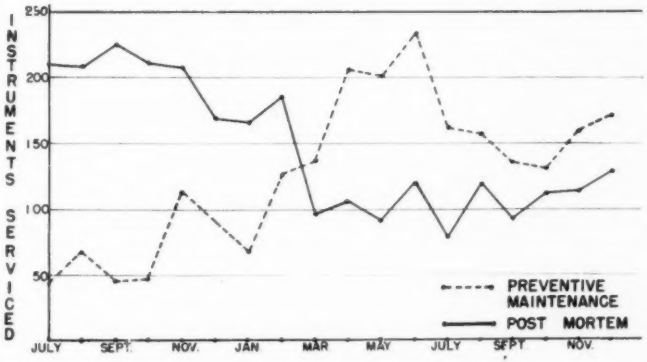



Fig. 1. This instrument service record shows what a good servicing program accomplished in a few months

From an average of better than 200 such calls per month in 1946, the total dropped to an average of 100 per month in 1947 with a corresponding cut in factory downtime. The service crew contained seven men during this entire period. No additional personnel was needed to carry out the preventive maintenance program, as the time spent on it was compensated for by the reduction in "post mortem" calls.

It is expected that the trouble call level will drop still further as more comprehensive preventive maintenance schedules are inaugurated.

In addition to the savings that can be realized if plant equipment is kept in top running condition, preventive maintenance can be planned for a time that is mutually convenient to both the manufacturing and the service personnel. This eliminates the time lost by operators standing by while equipment is being repaired. It also prevents the rush and slack periods encountered by a crew that works on a "wait-for-something-to-happen" basis.

As every foreman knows, downtime is an expensive headache on any active production line. Operators cannot perform their normal duties, a process is delayed, and an unbalanced operation can easily be created in an entire manufacturing cycle. The preventive maintenance program is aimed at minimizing such factors when they are the result of instrument failures.

### How Preventive Maintenance Schedules are Set Up

Preventive maintenance works on a simple formula. Certain component parts of any equipment will require replacement because of a relatively short natural life. Two common examples are batteries and thermocouples. Other parts, such as moving contacts, switches, and adjustable resistors will need cleaning or repair because of dirt or actual physical wear. The technique is the same in both cases; either the average life expectancy or the period of normal operation is determined and the required replacement or cleaning schedule is set up within this period.

## *Preventive Maintenance or Post Mortem?

Several factors must be considered in setting up these schedules. The service engineer must know the equipment, its application, location and utilization. Both the frequency and method of preventive servicing depend on these factors. In the case of thermocouples, the type of wire used, the operating temperature, the atmosphere to which they are exposed and the accuracy required, all play a part in setting up a replacement schedule.

Physical location of equipment must be analyzed to determine the effects of such factors as vibration, shock, dust, humidity, and ambient temperatures. Complete service data for the past performance of each piece of equipment is of infinite value in determining the service procedure to be followed to prevent trouble.

The Instrument Service Section of the Pittsfield General Electric Plant has faced this problem. With approximately 1000 process control instruments and 400 special electrical tests to be maintained in good working order, an effective preventive maintenance program was a must.

### Examples of Preventive Maintenance

Such critical processes as steel annealing, heat treating castings, wire enameling, tool hardening, and tube rolling depend on the reliable and accurate control provided by instrumentation. Electrical tests of all types are relied upon to insure a steady flow of quality products from the assembly lines. The service problem was solved by establishing a schedule of preventive maintenance for each instrument and test.

In annealing transformer steel, nickel molybdenum thermocouples are used in the furnaces to measure the load temperature. From past service records, it was determined that these thermocouples started to deteriorate and, in many cases, open circuited during the third month of use. All of the furnaces were operated 24 hr a day, 6 da a week. A thermocouple failure sometimes meant the loss of a load of steel and in every case the production was interrupted. By changing all of the thermocouples every two months at a time when the furnaces were empty, the average number of failures was reduced from 12 to 1 per month.

Batteries used in the control instruments for this same process were another source of trouble. The picture here was not so simple, however. They lasted anywhere from 3 to 6 mo, depending largely upon the ambient temperature. Where the temperature was high, the battery life was about 3 mo.

In order to establish a routine for changing the batteries, two were used in parallel where high ambient temperatures had to be tolerated. By doing this, all of the batteries could be changed every 5 mo, thus eliminating down-time caused by dead batteries.

Temperature control instruments are serviced and calibrated every three months. Moving parts such as cams and gears, are cleaned and oiled, worn parts replaced, pens and printing mechanisms cleaned and galvanometer balance checked.

This overall preventive maintenance program for the instrumentation on steel annealing processes has cut the post mortem calls by eighty per cent, with a corresponding reduction in down-time. A similar program has been set up for all of the other process control installations.

Maintenance schedules have also been established for each piece of electrical test equipment, such as high potential sets, capacitance and power factor bridges, Kelvin bridges, ratio berths and coil turn counters. Each test is calibrated and inspected, contacts, potentiometers and switches are cleaned, and safety interlocks are inspected. The frequency and type of service varies with the equipment.

A typical test is shown in Fig. 3. This is a precision capacitance and power factor bridge used in the testing of capacitors. Since the contact resistance of the decade switches must be maintained at a very low value, the contacts are cleaned with carbon tetrachloride, polished with emery cloth and covered with a thin film of vasoline every month.

Test leads are inspected at the same time and replaced if they show signs of wear. The bridge is calibrated every 3 mo against precision standards to be certain that it meets the degree of accuracy required of it. The shielded power supply components and test cubicle are on the left of the rear view photograph of Fig. 3 and the detector and bridge components on the right. All parts are readily accessible for servicing.

Record keeping for this system of preventive maintenance is based

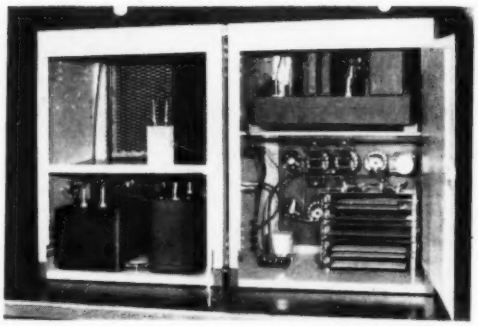


**Fig. 3. Capacitance and power factor bridge used in testing of capacitors. Contacts are cleaned and polished every month, the bridge is calibrated every three months**

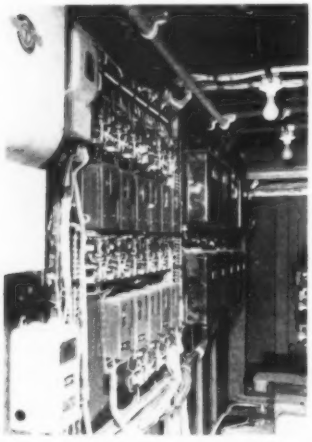


**Fig. 2. Inside view of a typical furnace temperature control panel designed for ease in servicing. Well lighted and arranged so a service man can work**

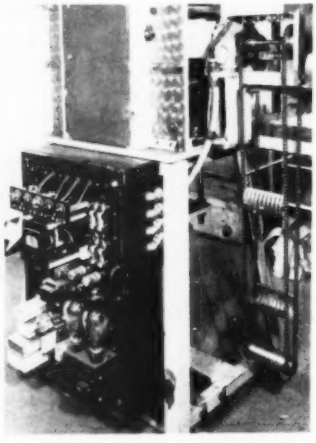


**Fig. 4. This electronic control panel for a capacitor winding machine has a time meter installed to indicate when tubes should be replaced**

on simple record and report forms, and a maintenance repair code. When an instrument is purchased, a record card (A of Fig. 5) is made out, containing all pertinent information concerning the device. At this time a shop number, which will identify it for its entire life as a maintenance or repair unit is assigned to the device.

The code, shown by B of Fig. 5, lists the maintenance and repairs likely to be made. Each of these is identified by a number.

Each service man carries a small loose-leaf book of record sheets (C of Fig. 5) on his rounds. One type of sheet is used for temperature equipment, the other for special test equipment. On these sheets the service man checks off the numbers of the maintenance or repair items he performs on the call. At the office, this information is transferred to a card similar to that shown by D of Fig. 5. The shop number of the instrument is the filing identification for the card.

On this card is marked: the date of the call; code numbers of the work done; T or P to show whether the work was done for trouble or preventive maintenance; and, the number of hours and code units for accounting purposes. As these cards are filled, they are filed in a larger cabinet and replaced with another.

The preventive maintenance schedule for each instrument is outlined in a master reference book by departments. Two of these books are kept, one for temperature instruments and one for special test equipment. All equipment in each department is listed, with the dates work is scheduled to be done to serve as a work guide. The scheduling is done to give a reasonably uniform work load through the year.

Another important part of the service engineer's job is to recommend improvements in the design of equipment. Chronic sources of trouble must be investigated and suitable changes made in the equipment to eliminate them. This usually means redesigning the weak components or replacing them with more suitable substitutes. The equipment builder is advised of the weakness in an effort to prevent their appearing in future equipment.

A meter, to record actual operating time is sometimes installed to aid in establishing the maintenance schedule. In one case, such a meter was installed on a piece of equipment to determine when the Thyratrons needed to be replaced. The normal life of these tubes was found to be about 1000 hr of operation. The time meter accurately indicates when this point has been reached. A time meter, installed on an electronic control, is shown in Fig. 5.

The smart motorist has his car periodically checked and overhauled to prevent breakdowns on the road. The not-so-scientifically-minded tourist is often seen with his head under the hood many miles from nowhere. As does the wise motorist, the progressive instrument service man checks the factory equipment periodically in an effort to prevent troubles. The factory that waits for trouble is inviting expensive shut-downs with loss of production and materials, and high repair bills. Preventive maintenance minimizes such costly procedures.

## — IF YOU WANT MORE DETAIL

**The complete Instrument Service Code, B of Fig 5, has been built up from extensive experience with hundreds of instruments of all kinds. It totals 122 items. The complete list is available to you. A copy, together with the two loose leaf serviceman's record sheets, C of Fig 5, will be sent to readers if the request is received before May 1, 1948. Address a letter to the Editors or mark "Instrument Code" upon the postcard.**

Fig. 5. **Typical instrument record cards. A. Data card for each instrument. B. A portion of the service code used. C. Front and back of the loose leaf sheets carried by the servicemen. D. Office record made from servicemens' reports**

# The Use and Care of WIGWAM REFUSE INCINERATORS

**Mill refuse disposal . . . Wigwam design and construction . . . Proportioning the structure . . . Air supply, cooling, and burning . . . Refuse feed and ash removal . . . Burning felt and paper saturated with asphalt . . . Capacity in relation to size of unit . . . Cost and maintenance considerations . . . Further details of the new Macon, Ga., board mill**

By **JOHN D. LYALL**, Project Engineer, **Armstrong Cork Co.**

WIGWAM TYPE refuse incinerators are not new for they have been employed for some years west of the Rocky Mountains for the burning and disposal of saw mill refuse. As far as our knowledge goes, however, this type of burner had not been used in connection with the disposal of refuse bark, sawdust and end trimmings from a slasher saw and barking drum prior to the installation of a Rees Type burner at the new Armstrong Cork Co.'s plant in Macon, Ga. We believe that this is the only such burner located east of the Mississippi River.

Archer and Rees burners[1] look alike on the outside, but are arranged differently on the inside. In both cases, however, the general purpose of the arrangement is to carry on combustion in the presence of high excess air. This keeps the temperature of the structural parts of the incinerator low and permits the use of inexpensive materials and designs.

## Details of Design

Archer burners are set up on a circular foundation with the floor of the wigwam some 5 to 6 ft above the surrounding grade line. The floor is then equipped with cast iron grates. Tunnels are provided through the base to permit the entrance of air and the removal of ash that passes through the grates. Above this floor a "wigwam," made of sheet steel supported on a structural frame of pipe or steel angles, is placed in such a way that there is an opening between the sheet steel skirt and the floor to permit the entrance of air.

Rees burners are set up on a concrete ring base set level with the surrounding grade. The steel "wigwam" structure is supported on the outside edge of the concrete ring and a brick wall is erected on the inner edge. Space is provided between the skirt of the wigwam and the concrete base for the admission of air. A multiplicity of small doors are provided in the brick wall to permit the entrance of air to the combustion space. The brick wall is approximately one quarter the height of the wigwam and at its upper edge comes quite close to the inner surface of the wigwam.

The wall is then further extended by means of corrugated sheet metal up to about the mid-portion of the wigwam. The top of the wigwam is covered with a screened dome equipped with a drag chain on the outside and a walkway to permit cleaning of the screened surface by dragging the chain over it. In the center of the ring foundation three small grates are provided in the dirt floor. These are connected by steel pipes to an air blower for use in the initial ignition of the refuse. The general construction is shown by Fig. 1.

In general, the body of the wigwams are proportioned in the shape of the frustum of a cone with the height approximately equal to the base diameter and the diameter at the top varying from 40 to 50 per cent of the base diameter. Above the frustum is mounted a spherical or approximately spherical heavy wire screened dome.

Flow of air passing under the skirt of the wigwam and over the foundation slab divides, part passing through the doors in the brick wall and part rising between the outside of the brick wall and the inside surface of the wigwam. This air cools the outside of the wall, then proceeds to pass between the corrugated metal liner and the wigwam cooling the liner and then mixes with the hot gases coming out of the combustion chamber to complete the combustion. The mixture then passes through the screened dome. Draft produced is prodigious.

The cooling effect produced by this draft combined with the excess air used in the combustion chamber keeps the temperatures sufficiently low to permit constructing the burner of inexpensive materials. The brick wall may be of ordinary red building brick, the inner liner of corrugated sheet steel, the outside of thin steel sheets and the frame of commercial pipe or structural steel angles. The temperatures are never high and paints will adhere on the outside.

Refuse is fed into the burner just over the top of the inner metal lining, or, just above the mid-portion of the wigwam. It may be conveyed

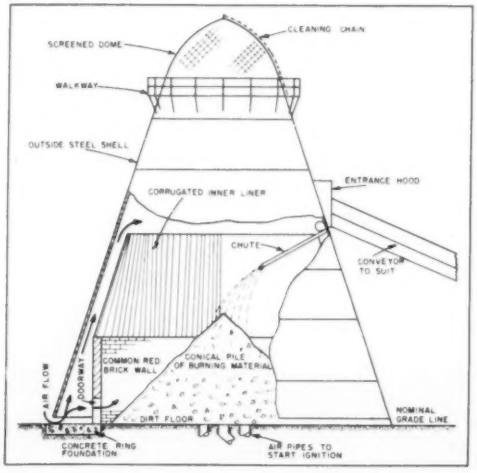



**Fig. 1. Details of the Rees Wigwam refuse incinerator as installed at Armstrong's new mill at Macon**

[1] EDITORS NOTE—Names and addresses of companies that specialize in the manufacture of these refuse burners will be supplied upon request. Address the Editors or write "Wigwam" on the postcard, pages 18 or 58.

to this point by drag chains, scraper conveyors, or it may be blown and separated from the air in a cyclone at this point. Any method of delivery is satisfactory so long as the equipment can withstand the temperatures encountered at this section of the wigwam. Where conveyors are used, it is desirable to equip the head shaft with water cooled bearings, and to arrange the drive on the tail shaft. Inside the wigwam, a chute is provided for conveying the refuse to the middle of the wigwam where it piles up into a conical pile.

Burning occurs on the surface of the conical pile. It is quite rapid as the air through the doors in the brick wall enters with considerable velocity, and, due to the arrangement of the doors, proceeds in a circular or spiral-motion over the surface of the conical pile as it rises toward the outlet at the top. Most of the bark and wood waste entering the burner contains considerable moisture and does not burn until it has lain on the hot pile long enough to dry the moisture out. Then it flashes into fire and burns rapidly.

**Table I. Rating of various burner sizes in sawmill capacity. Burner capacity in pounds may be approximated by multiplying the board feet rating by 3500**

| BURNER SIZE | RATING | |
|---|---|---|
| Base Diameter in Feet | Sawmill Output in M Board Ft/24 hr | |
| | Rees Type | Archer Type |
| 40 | 90-120 | 75-100 |
| 50 | 120-210 | 100-180 |
| 60 | 180-270 | 150-240 |
| 63 | 270 | ——— |
| 70 | 225-300 | 180-250 |

Ash gradually works its way to the bottom of the conical pile and is deposited upon the floor of the wigwam. The volume of ash produced from burning wood and bark is very low and is removed from the burner only once in several months. At this time the burner is shut down and the ash removed in a wheelbarrow.

The smoke emitted from the screened dome is free of burning sparks and fly ash. It is whitish blue in color, and on still, damp days may extend for a distance of 100 ft or so. On windy days, smoke is not in evidence for more than a few feet, if at all. Burning of felt, paper or wallboards, which have been saturated with asphalt, in this burner produces black smoke and heavy hard clinkers.

The burning capacity of these burners is rated on the lumber produced per day by various sizes of saw mills for these burners are primarily used in conjunction with saw mills. The size of the burner is specified by its diameter at the base. The burning capacity for a given size varies for different geographic areas, due to the difference in the moisture content of the saw mill refuse.

**Fig. 2. Aerial view of the new Macon mill with the Wigwam incinerator indicated by an arrow**

For example, the Rees burner is normally used in saw mills in the northern and northeastern part of California and the southwestern part of Oregon. The Archer burner is normally used in northern, central, southcentral, and the eastern part of Oregon, as well as throughout the State of Washington.

Mill refuse burned in the area where the Rees burner is employed, runs lower in moisture content than in the area where the Archer type burner is more generally employed. This results in the normal rating of the Archer equipment being 20 to 25 per cent less than the Rees burner.

Table I gives the normal rating of various sized burners in mill capacity. To convert these ratings to cords of wood being barked in a paper mill, we find that: 1, lumber weighs 4,000 to 5,000 lb per thousand board feet, as cut, with an average of 4,500 lb; and 2, logs weigh 6,000 to 10,000 lb per thousand board feet of log scale, an average of 8,000 lb.

Hence, the difference between the weight of logs and lumber produced, that is 8,000 — 4,500 or 3,500 multiplied by the rating of the burner in thousand board feet equals the weight of saw mill refuse that may be burned in a particular burner.

The average weight of bark, slivers, sawdust and end trimmings coming from a barking drum and slasher saw will be in the order of 700 lb per cord of wood, but varies from paper mill to paper mill, season to season, and from one species of wood to another.

Due to the many variables encountered in determining the actual quantities of waste to be disposed of in a paper mill, as well as the burning rates of the waste wood and bark, it is not advisable to select a burner of normally rated capacity that is close to the expected volume of waste to be burned. The difference in cost between various sizes of burners does not justify consideration of skimpily sized burners. The maintenance cost rises rapidly if the burner is overheated, or overfired. Therefore, in selecting such a burner, make it amply large.

Such burning equipment, it should be noted, is not suitable in any operation where heat is to be recovered as its basic principle is to keep the temperatures low. It may, however, have other applications in paper mills and general industry where hard-to-dispose-of materials are encountered.

### The New Mill

The new Armstrong Mill, just south of Macon, Ga. on the Central of Georgian Railway, was built to produce Armstrong's fiberboard, Temlock, from loblolly pine. The plant will employ approximately 300 people and the production and warehouse areas cover nearly 5½ a.

Advantage was taken of the sloping site so that a portion of the building is two-story height. A pulping building occupies the lower ground and is connected to a 400 ft sq finishing and warehouse building by a forming and drying building 1200 ft in length.

Every effort has been made to make the plant as cool and pleasant for personnel as possible. Coated glass has been installed on the south and west exposures and the ceiling heights throughout have been generously proportioned. The buildings are lighted, in general, with incandescent lighting with the exception of areas directly associated with finishing machines, or, areas where extra light is required. Here fluorescent lighting is used.

Process water for the plant is obtained from artesian wells while drinking water is purchased from the city of Macon. The fuel used is natural gas. The fabricating department is heated with unit heaters.

Service and auxiliary facilities include a large machine shop and maintenance shop with hand-operated bridge cranes over all major items of equipment.

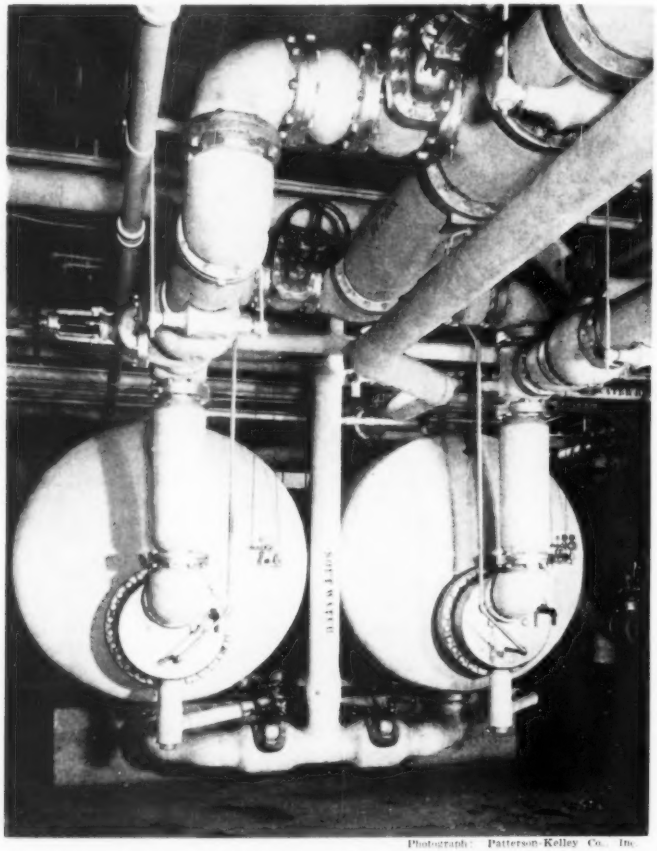
# Planned Maintenance of Water Heaters

**Scheduled inspection and maintenance of water heaters will pay plant engineering department in lowered ultimate costs for service . . . Consideration of three sections of heating system—steam section, water section and control section . . . Common troubles of each section and suggested remedies . . . Check chart of possible trouble locations**

**By TYLER G. HICKS, Consulting Engineer**

UNIFORMITY OF manufactured products, satisfactory cleaning of buildings, and suitable domestic water temperatures are significant factors in successful plant operation. Since these factors are dependent upon the condition of the plant hot water heater and its controls, the importance of a well-maintained system can readily be seen.

Hot water heater maintenance, when performed at proper intervals, is simple and requires only a small amount of work. However, if maintenance is neglected, there will come a time when an expensive, man-sized repair job will be required. The easiest and simplest way to avoid expensive repair jobs and costly delays in manufacturing is to establish a comprehensive maintenance schedule.



Photograph: Patterson-Kelley Co., Inc.

**This photograph shows two heaters installed in Cook County Hospital, Chicago. This type heater is built in such a manner that steam coils may be removed easily for inspection and maintenance.**

An analysis of the usual instantaneous and storage heaters shows that they consist of three sections or parts. These are (1) the steam section consisting of coils, piping, traps, and valves, (2) the water section, comprised of tank, piping, and valves, and (3) the control section, with its thermostat and air or electrical devices. Breaking the heater down into sections like these permits ready understanding of its operation and easy division of the maintenance work.

The steam coils, whether straight or U-shaped, are subject to at least two common troubles. These are corrosion and scaling on either the inner or outer walls of the tubes. Inner wall corrosion usually results from excessive amounts of air in the tubes, or the presence of boiler compounds in the heating steam. Scaling is caused by the use of impure steam or excessively high steam temperatures. To detect corrosion and scaling, the steam coils should be removed annually and thoroughly inspected. Heaters of the type shown in Fig. 1 are arranged for easy removal of the coils.

During the period the coils are out for interval inspection, the exterior tube walls and heater piping connections should be examined. Scale or corrosion is not quite so common on exterior walls, but when it is encountered an analysis of the water supply will usually reveal the cause. A suitable treatment must be applied to prevent further corrosion.

If interior corrosion is found, the coil air vent should be checked to see that it operates properly. Air trapped in the coils can cause serious corrosion and reduce their heating capacity. Corrosion in the lower coils usually indicates improper use of boiler compounds. Boiler room records will show how much compound has been used, and the amount can be reduced to lessen corrosion. Table I lists the usual troubles encountered in the three sections of heaters. Parts not discussed in this article but listed in Table I should be inspected annually. Usual maintenance procedures are suitable for these parts.

The water section, consisting of the tank, piping, and valves, seldom causes trouble. Most modern tanks are made of corrosion resistant steel or are lined with copper to prevent corrosion. Frequent blowing down of the tank during periods of low load will remove most solids. Weekly or bi-weekly blow downs are usually sufficient. Older tanks which are not corrosion resistant can be protected in the following way. The

**Table I. Hot water heater maintenance check list provides quick reference to possible source of trouble**

| Steam Section | | Water Section | | Control Section | |
|---|---|---|---|---|---|
| Part | Usual Troubles | Part | Usual Troubles | Part | Usual Troubles |
| Coils | Corrosion and Scale; Internal or External | Tank | Corroded; Filled with Sludge | Steam Control Valve | Bellows Worn Or Leaky |
| Air Vent | Clogged, Corroded, or Broken | Manhole | Leaky Gasket | Thermostat | Scaled or Coated with Slime |
| Steam Control Valve | Worn Seat or Disc; Broken Stem; Clogged Opening | Relief Valve | Corroded; Dusty; Leaky | Air Supply | Insufficient Or Excessive Pressure; Moisture or Oil Entrainment |
| Traps | Worn Parts; Clogged Pipes; Leaky Gaskets | Check Valves | Broken; Worn | Air Failure Alarm | Defective Bell, Horn, or Light |
| Strainer | Dirty | Tank Vent | Clogged; Corroded | Thermometers | Broken, Dirty, or Bent Out of Place |
| Steam Gage | Worn; Corroded | Drain Valve & Line | Corroded; Broken | | |

tank is drained, the interior brushed clean, and all scale and rust scraped off. Then the interior is painted with a thick, paste-like mixture of a standard tank coating.

The tank interior should be inspected annually with the steam section. During this inspection care should be exerted to prevent loosening of any protective coatings. The usual coating will last two or more years, but any peelings or swellings must be cut out and replaced during the annual inspection. A careful check of the items listed in Table I, during the annual inspection, will usually prevent serious trouble in the future.

Hot water heater control systems vary considerably in design. However, most systems contain a thermostatically or air-operated steam control valve and several thermometers. Since steam flow to the heater is regulated by the control valve, proper functioning of the thermostat or air supply system is imperative. Thermostats occasionally become coated with scale or slime, with resultant faulty operation. Semi-annually the thermostat should be removed after isolating the heater by closing all valves, and inspected. The element must be clean and free of scale.

**Table II. Typical hot water temperatures for various types of service in industrial plants, institutions and commercial establishments**

| Service | Temp., F |
|---|---|
| Floor Cleaning | 150 |
| Other Cleaning | 130 |
| Showers, Wash Basins | 130 |
| Cafeteria, Kitchen | 130 |
| Process | 100 to 212 |

Air control systems usually contain a thermostat actuated by the water temperature. The thermostat regulates air flow to the steam control valve. Air for this system should always be clean, dry, and oil-free. A suitable filter and separator installed in the air line ahead of the control system will aid in reducing maintenance work. A semi-annual inspection of the air system is usually sufficient.

After completion of all maintenance work, it is well to check on the water temperature leaving the heater. The temperatures given in Table II can be used as a guide for resetting control devices. The values given are typical of standard hot water practice in the United States.

As a final step in the maintenance program, a record card for each heater should be prepared. This card usually lists the name of the heater, type, capacity, and date of purchase. Below these items space is left for recording inspections, repairs, and the date of each.

Thus, a simple program such as outlined in this article will go a long way towards eliminating heater troubles. A more efficient and cleaner plant will certainly result from such a program.

# Two Level Foundation for Sewer

**Fig. 1. The sectional sketch illustrates an unusual installation of a sewer which is located near other construction, the foundations of which are at a level lower than the bottom of the pipe. The sewer is supported on a concrete cradle designed for preserving continuity of alignment should the earth bank slide into the opening for the adjacent construction**

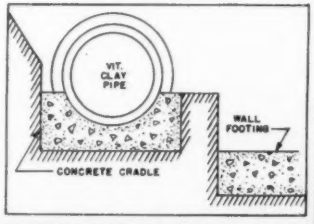
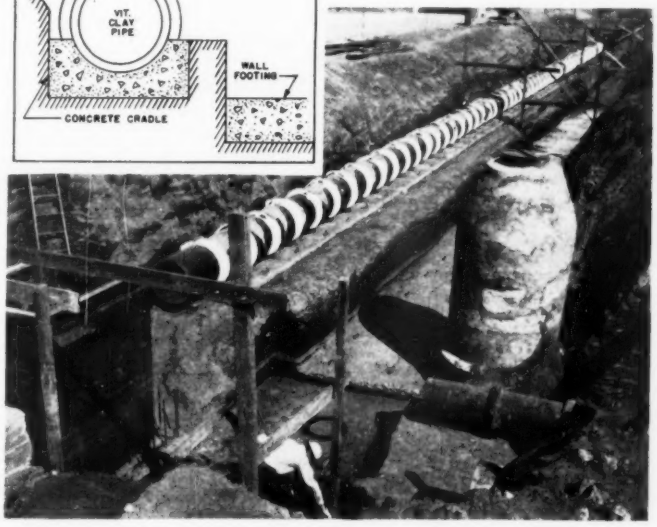



**Fig. 2. The engineer who describes this installation says: It is difficult for me to determine whether or not the concrete cradle is also needed to resist vertical loadings. That question in this particular instance does not seem important and I do not think it worth the time involved to discover whether or not the original designers had that in mind. Protection against horizontal movement is sufficient in itself to justify the use of the cradle so the protection against vertical movement is obtained at no cost.**



# SELECTION, USE AND CARE OF TOOLS

## Pliers are Important, Choose Them Carefully

By THOMAS TRAIL

PLIERS ARE AMONG the most used tools in the shop—steel hands that multiply greatly the gripping power of human hands. These versatile tools are made in a number of styles and sizes, each intended for a particular type of work.

Most mechanics usually find the adjustable general use pliers (sometimes called combination slip-joint pliers) of greatest utility. These pliers range in size from about 4½ to 10 in. in length, all having two sets of gripping teeth, one for flat material and the other for round objects. For carrying in the pocket or in a belt tool holder, the 6 in. size will be found convenient. The slip joint feature permits them to be readily adjusted to conveniently handle small and large work, the maximum capacity being largely determined by the length of the pliers. General use pliers are made in plain and wire cutting types, and in regular and thin nose patterns. The thin nose style is convenient where insufficient space exists for the use of regular thickness jaws.

In selecting a general use pliers, the most important detail to examine is the slip joint. This should be constructed so as not to slip or jam, because either fault will render the pliers practically worthless. Only pliers made of good grade tool steel can be depended upon not to wear excessively at this point, and only one made by a reputable manufacturer will be sure to have a smooth operating joint. Look also for satisfactory alignment of jaws and not too much sidewise lost motion. The teeth should be well formed and clean cut and the handles should afford a comfortable slip-proof grip.

Electricians, of course, require a lineman's type pliers, Fig. 1. Since this tool is used to a considerable extent for cutting wires, it is essential that at least the cutters be of high grade steel in order that they will retain keen cutting edges. This type of pliers does not have a slip joint but it is just as important that the joint be sturdy and well fitted, and that the pliers work smoothly and without lost motion. All the other details of construction to look for, mentioned previously, apply to this tool also. Lineman's pliers are made in sizes ranging from 6 to 8 in. in length, the 7 in. size usually being ideal for most electrical work.

Diagonal cutters (or diagonals, as they are sometimes referred to), Fig. 2, are used mostly by electricians, but they are also employed to a considerable extent in mechanical work. These are made in sizes ranging from 4 to 7 in. in length, the 5 in. size being handy for close quarter electrical work and the 6 in. size for mechanical work. The same selection suggestions apply to this tool as to lineman's pliers.

For larger diameter work that must be gripped securely with a pliers, the water pump type is ideal, Fig. 3. This pliers has a slip joint similar to the general use pliers, but, because of its general construction, this joint must be very well designed to prevent slipping while in use.

There are other variations of the water pump pliers, all utilizing the same operating principle. These pliers are made in sizes from 5 to 10 in. in length, the 6 in. size being ideal for pocket use, the 9 in. size for large work and the 10 in. size for very large objects.

There are several other types of pliers that are useful for general work, among which are the needle nose pliers, Fig. 4, the long-nose pin pliers, Fig. 5, and the duckbill pliers, Fig. 6.

Needle nose pliers are very useful for reaching into small openings and working in confined locations. They usually are fitted with wire cutters. The hinge joint is similar to that used on lineman's pliers.

For extra long reach in places difficult to work in, the long-nose pin pliers is well adapted. It has V shape grooves in the jaws to enable it to grip pins of various sizes when pulling them from apparatus parts. Its construction is similar to the needle nose pliers.

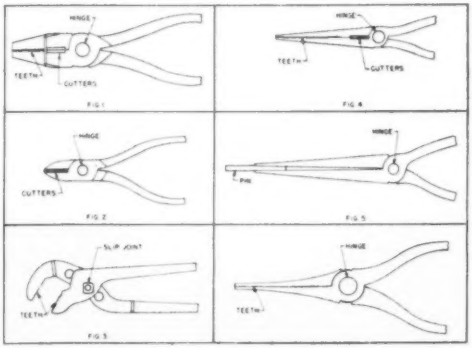
Duckbill pliers are similar to these two types but the jaws are flat and thin. They are especially adapted to making small apparatus adjustments calling for bending of metal parts. Several other styles of pliers are available for special applications but their value is generally restricted to such uses.

All pliers should work smoothly and freely and have relatively little lost joint motion. Cutter blades should meet evenly along their full length and cut cleanly and easily soft wire within their capacity. A simple sight test for cutting pliers consists in holding them toward the light and closing them. Any imperfection in the meeting of the cutting edges can generally be discerned in this way.

All plier joints should be given a drop of lubricating oil occasionally to keep them operating freely, reduce wear and prevent them from rusting. Pliers should not be thrown around in dusty or gritty locations since grit may work into the joints and cause excessive wear. After using, wipe pliers with a cloth very lightly moistened with lubricating oil, to prevent rust due to moisture on the hands and in the air.

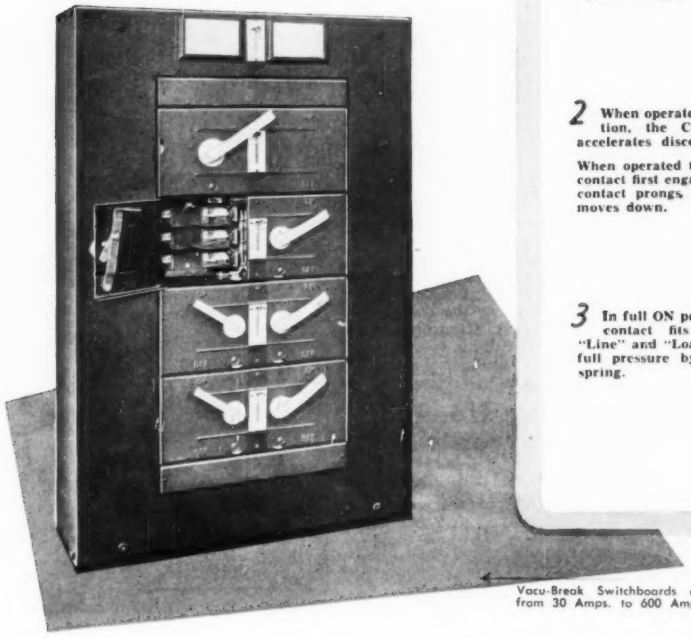
Use pliers carefully. Do not overload them, never hammer the handles of cutting pliers nor squeeze them in a vise in an effort to make them cut material beyond their capacity, do not try to cut hardened or tempered material, and never attempt to resharpen cutter blades. Jaw teeth, however, may be sharpened somewhat when worn if done carefully with a sharp edged or triangular file, though the file teeth in turn, may be damaged in the process.

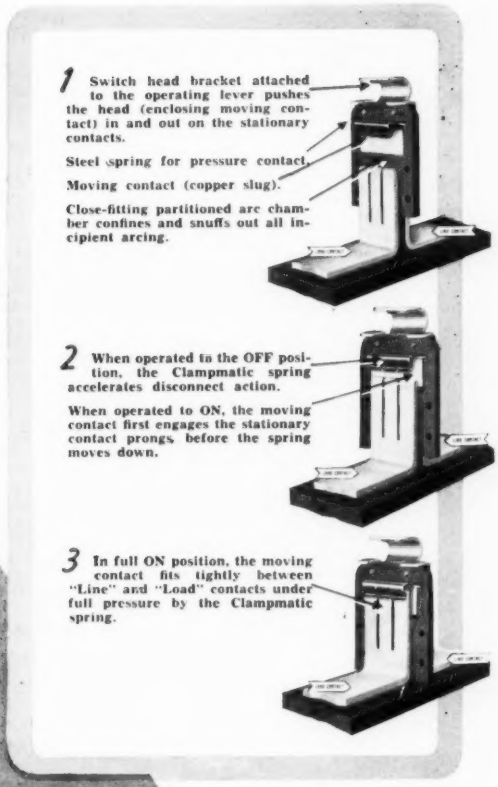
Excessive joint looseness in slip joint pliers may usually be corrected by tightening the hinge bolt slightly and riveting the end of the bolt lightly to prevent loosening of the nut.




**Figs. 1 through 6, Types of pliers shown are, respectively: lineman's, diagonal cutters, water pump type, needle-nose, long-nose pin, and duckbill**

# Switchboard that thinks twice of tomorrow




1 Switch head bracket attached to the operating lever pushes the head (enclosing moving contact) in and out on the stationary contacts.
Steel spring for pressure contact.
Moving contact (copper slug).
Close-fitting partitioned arc chamber confines and snuffs out all incipient arcing.
2 When operated to the OFF position, the Clampmatic spring accelerates disconnect action.
When operated to ON, the moving contact first engages the stationary contact prongs, before the spring moves down.
3 In full ON position, the moving contact fits tightly between "Line" and "Load" contacts under full pressure by the Clampmatic spring.

Vacu-Break Switchboards are available with circuits ranging from 30 Amps. to 600 Amps., 2 & 3 pole, 575 Volts and less.

THIS BullDog Vacu-Break Switchboard looks at the future with two definite factors in mind.

First is dependability of service that can be relied upon through the years. Second is flexibility to meet the changes which may come to the electrical system it controls and protects.

**Switch units** in this switchboard are famous BullDog Vacu-Break units, insuring reduced arcing with minimum maintenance. Contacts are made and broken in a special arcing chamber, where arcs are quickly snuffed out by lack of oxygen. Burning and pitting of contacts is curbed, prolonging switch life.

"Clampmatic Contacts" are another feature of safety switch units. Sturdy metal spring "fingers" hold contacts together tight as a bolted connection when switch is ON, release quickly and smoothly when it is thrown OFF. "Clampmatic" means cool operation and high conductivity.

**If circumstances** dictate extensive circuit changes, it is simple to adjust this switchboard. Individual units are interchangeable and replacement or additions can be made quickly to fit the new circuit conditions.

Call a nearby BullDog Field Engineer for complete information on the Vacu-Break Switchboard. Let him show you an actual installation near your plant.

**BullDog** Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

**BULLDOG ELECTRIC PRODUCTS COMPANY**

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

**BULLDOG**

**HEADQUARTERS FOR ELECTRICAL DISTRIBUTION**

# Maintenance and Operation

## Home Made Machine Speeds Repair Work

**Contributed by Herbert Bouton**

ONE PLANT engineering department studied the problem of repairing tire chains for 1700 vehicles and came up with the machine shown in the photo. It is made of spare and discarded parts which are combined with a welded frame.

The frame was made up and was mounted on a work table of convenient height. The bottom one of a pair of dies was fastened to the

**Fig. 1. Two strokes of the foot pedal are all the operator needs to open old links on tire chains and reclose links of new chain sections**

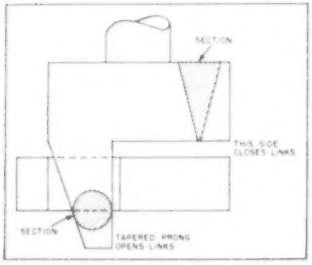



**Fig. 2. Two sides of the die are shown in this drawing. Cross hatched area represents sectional conformation of each side**

table. Above it was placed a discarded diaphragm air brake from a truck. The piston rod from this assembly had enough stroke and the piston or diaphragm enough area to furnish ample power when attached to the shop compressed air system which operated at 120 psi. On the lower end of the rod was mounted the upper die, so set that it registered perfectly with the lower die.

One side of this upper die was a prong, Fig. 2, circular in section and tapered to easily enter the closed link of the cross chains of the tire set. As it came down, this tapered prong entered a hole in the lower die and its constantly enlarging section forced the closed link open. The old link could then be disconnected from the side chain and a new one, with its cross chain, hooked into the link just vacated by the worn out piece.

Next the link is placed under the other side of the die and a second stroke of the machine closed the new link properly, as this second side of the upper die has a section similar to a rounded-edged flat cold chisel, which comes down on the open link and, forcing it against the flat bottom die, closes the link with one short stroke. On all strokes, the piston is controlled by a foot throttle, leaving both hands of the operator free to handle the chain.

## Measuring Heavy Direct Currents

**Contributed by Westinghouse Electric Corp.**

A STATIC direct-current transformer, like perpetual motion, has long been sought-after. A new device used by Westinghouse engineers called a Transductor comes close to achieving the same objective for one special purpose. It provides a simpler, safer way of measuring extremely heavy direct currents.

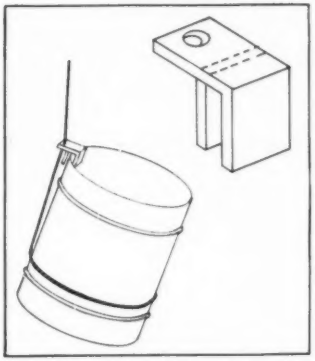
In electrolytic plants, where currents of many thousands of amperes flow in a single bus, the traditional method of metering is to use a shunt (which may be almost as big as an office desk) in the bus and measure its voltage drop. Often this means long leads and placing the full bus voltage to ground on the meter. Both are sources of trouble and a hazard

With the Transductor, however, the massive shunt is replaced by a special current transformer of the through type. The secondary winding is energized by alternating current of some convenient low potential such as 110 v. A change in direct current affects the reluctance of the Transductor magnetic circuit and in turn the current flowing in its a-c circuit. This alternating current is measured on a conventional ammeter calibrated in terms of the direct current in the heavy current bus. Curiously a change in a-c energizing voltage affects the meter indication only slightly. The scheme, under practical plant conditions, is accurate to one-half per cent.

## Hitch For Barrel Handling

**Contributed by H. Mack**

STEEL DRUMS with one head removed were employed in a foundry for the removal of contaminated sand. The drums were loaded by hand onto platforms, and then were transported to the loading dock just outside the foundry by means of fork trucks. Here the contents were put into dump trucks by means of an overhead electric crane. The manner in which they were attached to the crane hook was both simple



**Clip of this type permits quick dumping of barrel contents**

and effective. A choke hitch was made in the cable around the bottom of the barrel.

The barrel was prevented from tipping excessively by a special clip which was loosely threaded upon the cable. The eye of the choke hitch prevented the clip from slipping off the cable. This clip was placed in position on the top edge of the barrel and as soon as the strain came on the hook the clip held the barrel nearly upright.

When set down the clip could be slipped off the top edge and when the cable was hoisted the second time the barrel would instantly dump its load.

Many times the operators would speed up the process by striking the cable with a bar while it was still under strain. This would result in the clip's releasing the barrel to its dumping position without the necessity of a slacking off and a second lift. The clip was made of a short piece of $2\frac{1}{2}$ in. angle, with a cable clearance hole drilled in one leg and an additional leg welded to the angle as shown in the sketch.

## Tester for Traffic Paints

**Contributed by New Jersey Zinc Co.**

ACTUAL SERVICE tests of paints, particularly traffic paints, are difficult to obtain due to the period of time involved and the method of control. To speed up such work the New Jersey Zinc Co. developed a small abrasion tester shown in the photograph. It is small and compact and may be used in the laboratory, in the plant or on the roadway.

Built like the front of a car, the small wheels (made with multiple rubber discs) are mounted on an axle which carries the heavy weight. The wheels are set at an angle of 10 deg with the axle and rotate around the center shaft so that both a sliding and rotating action is obtained

**The paint tester in action. For laboratory use the man's arm is replaced with a fixed arm and clamp**

on the paint surface. A layer of sand supplies an abrasion factor. The wheels are weighted to a total of about 20 lb.

To measure the wearing properties of a test paint, the operator applies the test device, covers the surface with sand and slowly rotates the tester. Within a few minutes the film is worn down as much as would occur in several months of actual surface. By painting adjacent strips with different paints the comparative performance can be readily obtained.

## Freeing Frozen Threads

**Contributed by W. E. Warner**

WHEN PENETRATING oil is not available a good many mechanics have found that vinegar is an excellent substitute. This can be applied, when bolts are run horizontally into a vertical surface or on vertical bolts or nuts when there is no depression in the surrounding metal, by building a dam with putty around the threads in question. Kerosene, too, is a fairly good penetrating oil but it is not as effective as vinegar.

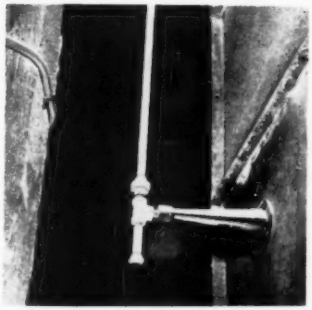
## This Extinguishing System's a First

**Contributed by Walter Kidde & Co.**

THE NATIONAL OATS CO. has installed what is believed to be the first automatic fire extinguishing system of its kind in its modern grain elevator and storage building at East St. Louis, Ill., to protect 400,000 bushels of feed grain.

Danger of fire is always present in grain elevators and storage buildings where induced-heat drying is carried on, where raw grain is stored long enough to create proper conditions for spontaneous ignition, or where electrical equipment can fail. Such fires are hard to detect and nearly impossible to combat with hand portable extinguishing equipment because of confined space and the enclosed-chamber design of elevator buildings. Once started, they usually consume the whole building and its valuable contents.

The automatic extinguishing system consists of a manifold of large steel cylinders containing liquid carbon dioxide under great pressure, a network of piping, rate-of-temperature-rise fire detectors and a series of discharge nozzles mounted in the



**Carbon dioxide discharge nozzles, flange-mounted in the walls of the drying oven, stand ready to extinguish fire that might start from induced heat drying process or flammable mixture of dust**

walls of the chambers where grain is dried and cooled. If fire starts in the hot-air drying chamber, the hot exhaust gases set off the detectors, ring an alarm and automatically open valves on the carbon dioxide storage cylinders.

When released, the carbon dioxide rushes under its own power through the piping, operates pressure trips that stop all machinery, blowers and furnace, and is discharged as an inert gas into the drying chamber where the fire has started. It cuts off the fire's oxygen supply and smothers it quickly and safely. The carbon dioxide does no harm to the grain in process and leaves no adulterant or residue.

**Synthetic rubber powder being poured into hot asphalt preparatory to resurfacing a section of street in an Ohio experiment**

## Rubber Streets May be Coming!

**Contributed by Goodyear Tire & Rubber Co.**

A "SYNTHETIC RUBBER" street is one of the latest developments to come out of Akron, O. In resurfacing a section of Exchange street, officials recently called for use of a new "hot-mix" combination that includes synthetic or finely powdered rubber, blended with conventional asphalt black top commonly used on city pavement. The plan was suggested by our company's research department as an experimental contribution toward long-lasting highways. The rubber was supplied without cost.

Engineers say the new "mix" gives a more nearly waterproof surface than regular black top applications; therefore is expected to be more resilient, longer-wearing and more resistant to cracking in cold weather.

Contractor for the resurfacing mixed the rubber in a finely powdered form with asphalt, blending the materials at a temperature of around 300 F. After remaining in the mixing tank overnight, the new "hot-mix" was transported to the job and rolled down to make the road surface.

# Questions and Answers

## Corrosion Troubles in a Processor

**Submitted by**
**M. A. Feldstein**

ONE OF THE machines in our plant, known as a Morton processor, consists of a cast-iron tank on which the top is fitted closely and in which we place textile materials. By means of a pump we circulate various chemicals through the textiles; these chemicals are usually caustic soda and sodium hydrosulphite. At the present time our greatest problem is rusting of the machine between processing cycles; then, when textiles are placed in the machine the rust stains them.

Do you think it would be possible to metallize this machine so that the rust could be eliminated? In assembling and disassembling the machine for loading and unloading we do some scraping of the parts and this fact should be taken into consideration in judging whether or not the metallizing would be practicable.

**Contributed by**
**John E. Wakefield**

We are, frankly, very dubious about the practicability of using metallizing for this application. The best metallized coatings for corrosion and rusting problems are generally zinc and aluminum. We believe that the caustic soda and sodium hydrosulphite which you are using would be detrimental to both these materials.

It is quite possible that stainless steel, Monel or nickel, although slightly porous, might solve this problem.

**Contributed by American Chemical Paint Co. and E. I. DuPont DeNemours**

According to the two companies listed above there is a possibility that sodium nitrate would be of help in preventing the rusting of the Morton processor. Between cycles the tank should be kept full of slightly alkaline water. If permissible, additions of about 0.05 per cent of sodium nitrite along with enough alkali to maintain a pH of at least 9.0, should be made.

**John E. Wakefield, author of "Metallizing, New Parts for Old," Jan. issue, Plant Engineering, repeats his offer to assist readers who have problems which might be solved by the use of metallizing. Just address your letters to Metallizing, Plant Engineering, 53 W. Jackson Blvd., Chicago 4, Ill.**

## Location of Idler Pulleys

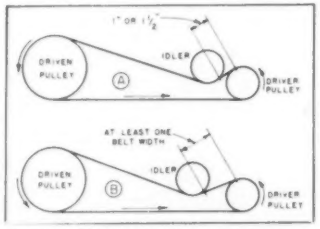
**Submitted by**
**J.N.G., Minneapolis**

THERE IS ONE machine in our plant powered by a flat belt which is driven by a motor. There is considerable slip and consequent loss of power so, apparently, we need to increase the arc of contact between the belt and pulley. Inasmuch as I have had no experience with flat belting I would greatly appreciate any information you can give me regarding the proper location of idler pulley.

• • •

SOME BAD examples of idler pulley installation have been noted in plants. One of these is shown at A in the accompanying sketch. The distance shown in the sketch is much too short although some engineers claim that this short distance gives more "wrap-around" to the belt. Others point out that the idler should be located so that a distance at least equal to the width of the belt is left between the closest points of belt contact on the driver and idler pulleys.

The reason for this is that when the belt comes around the crowned




**The installation at the top is not recommended; the idler is too close to the driving pulley. Increased distance as shown in lower sketch allows belt to straighten out before reversing again at idler**

motor pulley it should have adequate space in which to straighten itself out before the idler. If this is not done there is a crinkling effect that causes a characteristic break at right angles to the belt, in its center. If the condition is allowed to continue the crack will break clear through both plies of the belt.

It is true that an idler correctly used will enable a belt to pull heavier loads by increasing its arc of contact with the pulleys. In short, the idler increases the capacity of the belt. However, it usually is better practice to use a wider belt to gain the same capacity and thus avoid shorter belt life, lower efficiency, and increased maintenance cost.

## Fuses—

*(Continued from page 34)*

had voided all short circuit protection of the feeder. Feeders are of heavy cable and their potential short circuit current on fuses which have been tampered with is likely to create a dangerous fire or explosion.

Since internal fuse contacts must be regularly checked for tightness, a spare set of fuses should be maintained, and the fuses in use removed periodically for inspection. Where time is involved in renewing fuses, a spare fuse can be substituted on blowouts, and the blown fuses refilled when time will allow a thorough job of cleaning the fuse before renewing.

The most convenient method of testing the loads on fuses is by the use of the hook-on ammeter made by several manufacturers. Current readings can be made with this instrument without disconnecting the circuit and can be used on most sizes. One type of hook-on meter is made for both a-c and d-c currents, while the others are for a-c use only.

A standard ammeter can be used by connecting it to a dummy fuse which is then inserted into the circuit to be tested. The dummy fuse is made up by removing the renewable element, and soldering a wire to each terminal of the fuse. The dummy fuse, of course, does not give electrical protection while it is inserted and caution should be used.

Load tests should be made at periods of highest demand. Lighting circuits are highest on rainy days, while power circuit load conditions vary with the plant operations.

### Types of Fuses

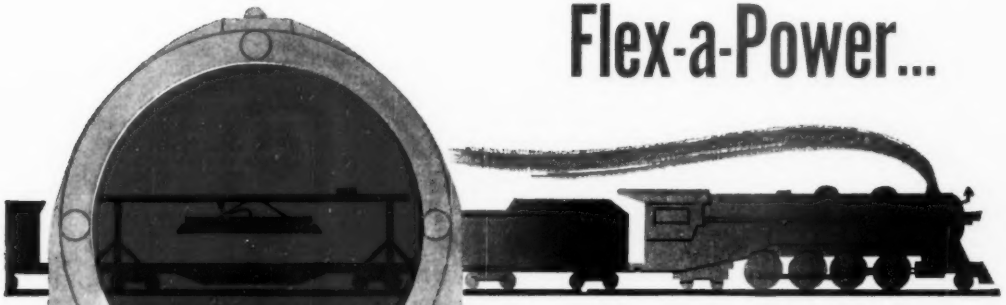
The type of fuse to be used depends on the condition of the plant and importance of proper maintenance.

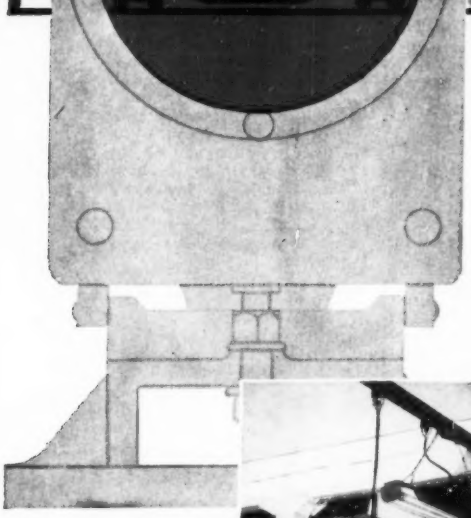
The Type S plug fuse is designed so that it cannot be easily bridged by the public with pennies or tinfoil. They are furnished with adaptors that permanently screw into the standard Edison shell. After the adaptor is installed, it cannot be removed and only the proper size plug fuse will then fit into the adaptor. A 30 amp Type S plug fuse will not fit a 15 amp adaptor. The Type S plug fuse is not at present a mandatory requirement of the Fire Underwriters, but in some areas, local ordinances require their use on new installations.

Renewable plug fuses are also available, as well as the standard non-renewable plug fuse. Locating blown plug fuses generally requires a lamp tester as on small overloads, the transparent plug fuses do not always indicate. Time delay plug fuses can also be obtained for protecting motor circuits.

*(Continued on page 52)*

## *You get 6 big advantages with* New LTG Flex-a-Power...

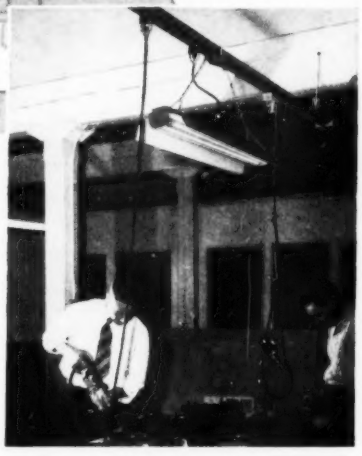




***The only unusually rugged plug-in or trolley busway in 2, 3 or 4 pole construction in one compact housing.***

Pre-fabricated LTG FLEX-A-POWER — rated 50 amps — 250 v, AC or DC — supplies power for fluorescent lights and power tools. It provides both trolley power take-off and a continuous outlet — you can tap at any point . . . ideal for industrial plants, offices, stores, arenas, work shops and garages. Here are more new features:

1. **EASY TO INSTALL** — simplified hanging and joining methods speed up installation.
2. **IT'S ECONOMICAL** — two or more circuits can be run in one housing — controlled separately.
3. **PERMITS BALANCED LOADS** — plugs or trolleys are polarized which provides a convenient means of balancing loads.
4. **IT'S REALLY RUGGED** — rigid construction of housing itself prevents sagging — only 2 hangers needed for each 10 ft. section.
5. **MORE FLEXIBILITY** — standard fittings such as elbows and radius sections permit economical custom installations — easy to disassemble and relocate.
6. **GREATER CONVENIENCE** — trolley with silver alloy contacts may be inserted or removed at any point along the run — no "drop-out" section required.



**FOR MORE INFORMATION,** write for circular TEC-3, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

***Men Who Observe the Best Electrical Practice Make It a Practice to Use***

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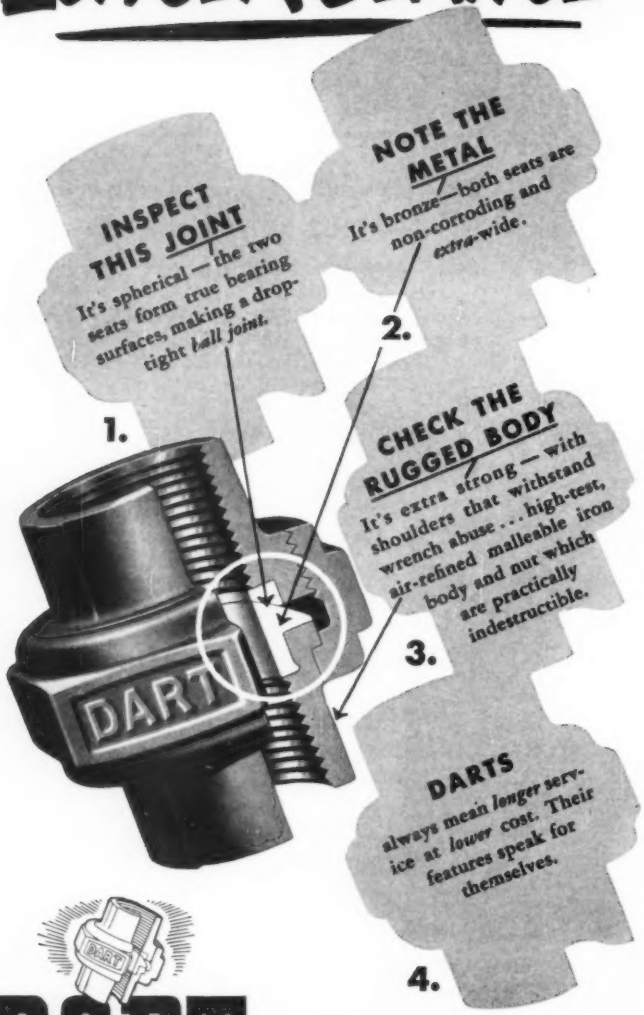
TRUMBULL'S TRAIN-LOAD OF NEW PRODUCTS

WHY DART UNIONS

Pay Off in

LONGER SERVICE


INSPECT THIS JOINT
It's spherical — the two seats form true bearing surfaces, making a drop-tight ball joint.
1.
NOTE THE METAL
It's bronze—both seats are non-corroding and extra-wide.
2.
CHECK THE RUGGED BODY
It's extra strong — with shoulders that withstand wrench abuse . . . high-test, air-refined malleable iron body and nut which are practically indestructible.
3.
DARTS
always mean longer service at lower cost. Their features speak for themselves.
4.
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DART UNIONS

E. M. DART MANUFACTURING CO.
PROVIDENCE 5, RHODE ISLAND


## Fuses—

(Continued from page 50)

Tamper-proof cartridge renewable fuses are manufactured in all sizes. This type makes it impossible to "double up" links and is easy to renew. For example, 400 amp links will not fit into the 200 amp fuse nor is it possible to put two 200 amp refills into a 200 amp case.

The standard link type renewable fuse is well known and needs little further description. In most types the link is bolted to the copper terminal and regular inspection for tightness of the internal contact will result in best performance of this fuse. Such inspections will reveal any "double up" links. In no case should the refill link be bolted to the switchboard directly without a fuse casing.

The National Fire Underwriters, through the Underwriters Laboratories, set the overload and short circuit requirements for all fuses on which the UND LAB approval mark is stamped. These requirements permit a brief time lag at 200 per cent of the fuse rating, a long interval before failure at 135 per cent of the fuse rating, and require the carrying of 110 per cent of the load rating indefinitely without excessive overheating.

Tighteners are available for keeping fuse clips tight, but their use will not substitute for loose contacts within the fuse, or looseness between fuse clips and connecting straps.

It is interesting to note that all fuse defects err on the side of safety. A good fuse may remain in service for an unlimited number of years, but its simplicity enables it to furnish the original protection. Its ease of replacement prevents the overuse of worn out parts.

The following recommended steps will reduce fuse blow-outs to a minimum:

1. Ventilate switchboard area if room temperature is abnormally high.
2. Check contacts of all fuse clips to bus bar. Clean and tighten knife blade contacts as well.
3. Check internal contacts of all fuses regularly. Where bolt is fastened to fibre support, use a heavy washer to back up the bolt against the fibre.
4. Clean internal contacts of fuse after blow outs.
5. Replace any fuse clips where spring temper has been burned out.
6. Prevent unauthorized personnel from replacing or "doubling up" fuse links.
7. In d-c only, remove any fuses on grounded neutral feeders by a solid bus.
8. Keep a spare set of all size fuses handy so that renewal operations may be made with plenty of time to do a clean tight job.

## New Products and Methods

(Continued from page 24)

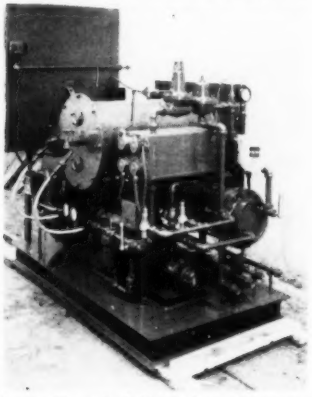
models are available in 1-½ ft and 2 ft widths by 3 ft, 4 ft, 6 ft and 8 ft lengths. Triple deck models are made in the smaller sizes. They are constructed of 3/16 in. steel side panels and have a sturdy steel base frame. The operation of the screen produces a positive eccentric action, and a maximum vibration amplitude of 3/16 in.

Mighty-Mite vibrating screens are economical to operate because they require only 1 to 2 hp. Screen speeds up to 1150 rpm. They will take loads up to 15 t per hour, depending upon the type of material to be screened and the size of the wire cloth openings. Screen Equipment Co., Inc.

### 30—AUTOMATIC BURNER

**A completely self-contained packaged combustion system**

Available for both automatic and semi-automatic control, this new burner incorporates a complete system of fuel-oil pumping and oil pre-heating equipment, forced draft blower, and wide-range constant differential mechanical atomizing oil burner; all mounted on a compact steel base ready to be bolted to the boiler



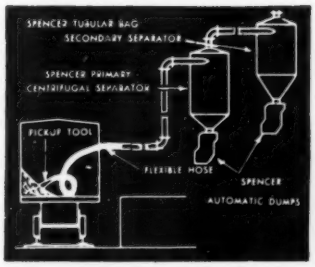
front. The only field requirement to complete installation is the connection of service lines. This burner is designed to fire boilers at capacities of 100 developed hp and upwards.

Economy is stressed as a major advantage of this burner. Since its installation doesn't require assembly of many related pieces of equipment there's a reduced installation cost. And its space-saving feature and "central station" efficiency offer opportunities for lowered overhead. Peabody Engineering Corp.

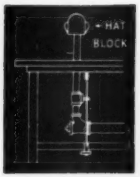
### 31—PRINTED TAPE

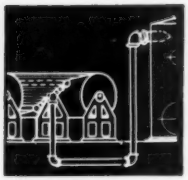
**For industrial use as coding and marking label**

Because of its easy and clean application, printed "scotch" tape is now replacing




*Lint is removed from finished hats and liner cloth, hats are cleaned, and freight cars are loaded, unloaded, and cleaned.*



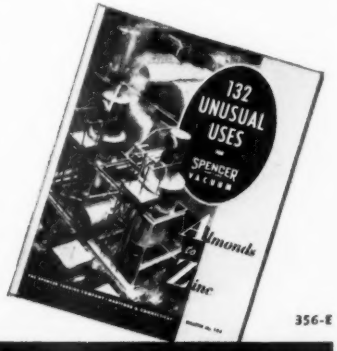
*Freight Cars, Hats and Textiles*

# ...WITH SPENCER VACUUM

Vacuum, the new tool for industry is handling raw materials by the ton, performing dozens of operations automatically on the production line, and removing lint, dust, and other materials, just before packing and shipping.

A few of the unusual applications are illustrated above, but the real progress comes when plant engineers understand the fundamental functions of vacuum and apply them to their specific manufacturing problems.

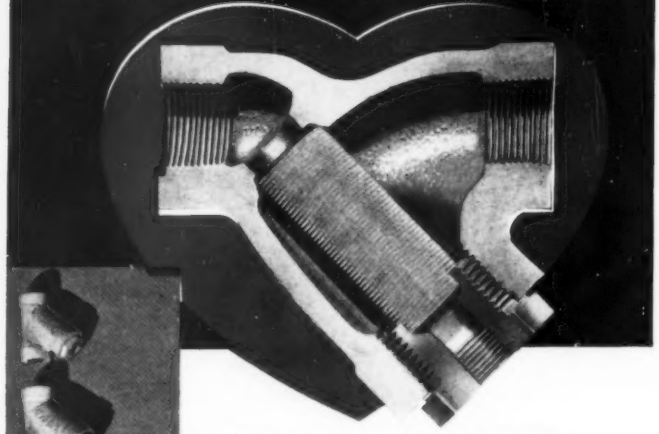
For instance, excess powdered sugar is removed from candy on a conveyor line. Almonds are set into the tops of cakes, bags are deflated, valuable metals reclaimed, and moisture removed from wet cloth—all with Spencer Vacuum and all explained in the new Spencer Bulletin—yours for the asking.




356-E

SPENCER VACUUM CLEANING
HARTFORD
THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

# The SCREEN of the YARWAY STRAINER



## MAKES PIPELINES *Lifelines*

- The heart of a strainer is its screen . . . and the screen in Yarway Strainers keeps pipelines open . . . prevents rust, scale and dirt from clogging equipment.
- *Screens* are of high-grade monel woven wire, fine enough for required straining service, yet having ample free area for passage of clean condensate, light oil or other fluids. Perforated screens if desired.
- *Screen cap* is made with straight thread, machined face and spark-plug-type gasket for attachment to body. Permits easy removal for cleaning. Insures proper alignment of screen when it is replaced in body.
- *Body* of Yarway Strainer is iron or steel, cadmium-plated for protection against corrosion and for better appearance.
- Available in six sizes, ½" to 2", for pressures to 600 lbs. Stocked and sold by 150 Mill Supply Houses. Reasonably priced.
- Hundreds of thousands in use. See your nearest dealer, or write for Bulletin S-201.

**YARNALL-WARING COMPANY**
**145 MERMAID AVENUE PHILADELPHIA 18, PA.**

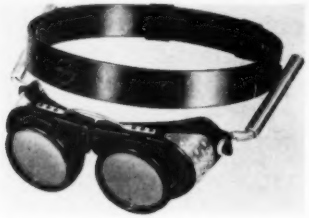
**YARWAY STRAINERS**
*"Police the Pipelines"*


"paste-on" labels and decals in many industries. It's adaptable as coding and marking label, instruction label, and routing marker, as well as for indicating contents of package. Can be used to hold component units together for final assembly. Tape comes in wide range of colors and widths. Transparent Products Co., Inc.

## 32—HEADREST GOGGLES

**Are lightweight and comfortable and easily adjusted**

These are said to be more comfortable than other goggles because headrest distributes weight over the entire head. Easy to raise and lower, the goggle assembly is hinged from sides of headrest by telescopic arms. Concealed springs hold gog-



gles against face. Federal specification lenses are standard 50 m size, available in shades 2 through 6 and held in individual eye cups of molded plastic joined together flexibly for easy fitting. Outside of each cup has ventilating screen and baffle plate to keep out flying particles and stray light rays. Headrest is light, clean plastic, easily adjusted to any headsize. Sweatband adds to comfort. Price $5.50, including lenses. General Scientific Equipment Co.

## 33—WALL WASHER

**For mechanical cleaning of all types of surfaces**

This mechanical washing machine, the Handeasy, is recommended by manufacturer for cleaning all difficult wall and ceiling surfaces, including moldings, corrugated metal, pipe risers, and rough brick, as well as smooth surfaces. Cleaning attachment requires no electricity and can be held comfortably in the hand. Cleaner and rinse are fed into washer by finger tip control. Ease of operation is said to reduce fatigue and increase washing speed.

Control is through valve in small aluminum plate which fits inside the palm. A synthetic sponge is basis of feeding cleaning solution and rinse. Fingerless terry cloth mitts are used over both sponge attachments for streakless cleaning. Mitts are washable. Quaker Maintenance Co.

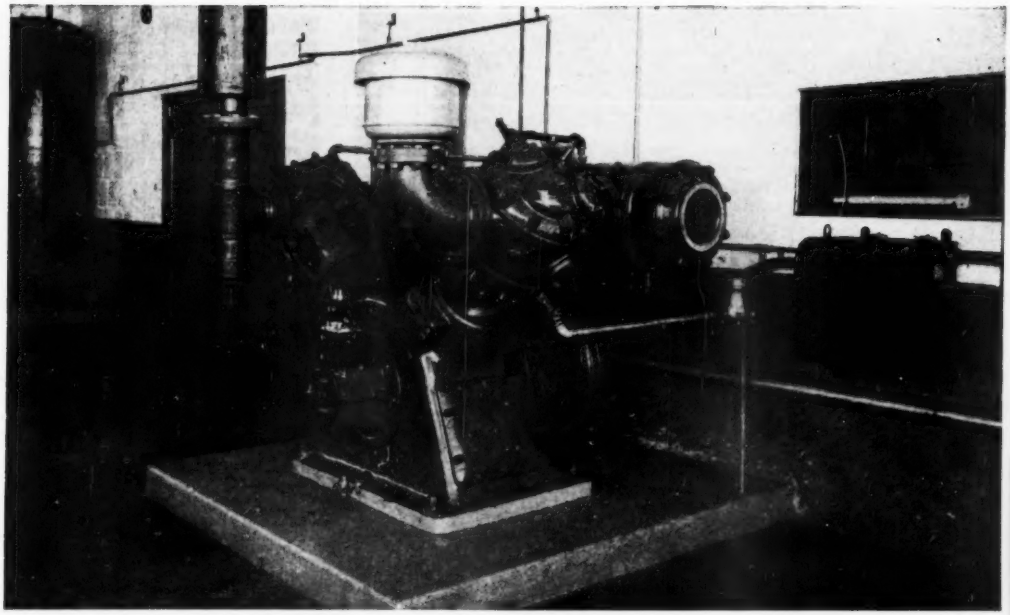
## 34—FLOOR MACHINES

**They can scrub, wax and polish, steel wool, trowel and grind**

Two new 1949 models have been added to this floor machine line.

The new models are known as SB14-A and SB16-A. Both models are equipped with new G. E. motor and gear units. This type of unit is said to give much longer, trouble-free service. It also reduces the overall height of the machine. New, stay-put rubber bumpers and rubber-coated, shock-proof switch levers are also emphasized by the manufacturer.

Model SB14-A is equipped with a 14½ in. diameter brush for scrubbing areas up to 5000 sq ft. Model SB16-A has a 16½ in. diameter brush for areas up to 7500 sq ft. In addition to all scrubbing operations, the manufacturer points out that the new models can be used for waxing and polishing all types of flooring; steel wooling; fine finishing of parquet floors; machine troweling; abrasive grinding and finishing on terrazzo, marble, concrete. United Floor Machine Company, Inc.



**Here's top efficiency in the 400 to 1800 c. f. m. range!**

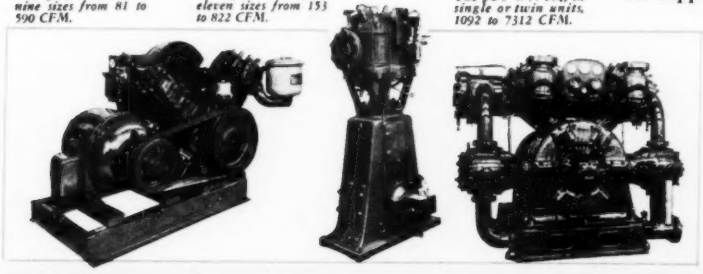
# The JOY WN-112 AIR COMPRESSOR

Built in sizes from 378 to 1828 CFM, the JOY WN-112 is a two-cylinder, two-stage, heavy-duty compressor with the exclusive JOY "Dual-Cushion" valves for top efficiency. Compact and highly modern, it saves space and cuts installation costs. ● JOY builds the most modern compressors available for either centralized or de-centralized air supply—*write for Bulletin.*

*The JOY WL 80, in nine sizes from 81 to 590 CFM.*

*The JOY WG 9, in eleven sizes from 153 to 822 CFM.*

*The JOY WN 114, in single or twin units, 1092 to 7312 CFM.*



*Consult a Joy Engineer*

W&D 12055

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GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

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# Bulletins . . . . Catalogs

**Keep posted on current practice, learn what other plant engineers are doing. Know the how and why when the need arises. Mark the bulletins you want by number—or ask questions on specific applications—on the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 18 and 19 and 58 and 59**

## ELECTRICAL

**101** **Synchronous Motors**—This bulletin, Form 1498, discusses in detail a line of synchronous motors for wide industrial use. Phantom drawings and cut-away illustrations of models reveal construction features of motors, and sketches show particular construction advantages. Technical data includes two graphs, one showing variation in gear load with inaccuracies and the other showing relationship of wear resistance to hardness of gear controls. Typical applications of these motors are listed. Handsome four-color illustrations add to both attractiveness and clarity of this 16-page book. U. S. Electrical Motors.

*If so...* **MODERNIZE**

**WITH SANITARY BRADLEYS**

IN this day and age modern, clean, sanitary washrooms are a prime necessity in good employee relations.

Bradleys are popular with management and workers alike because they offer many distinct advantages. Each Washfountain eliminates 16 to 20 faucets and reduces piping connections by 80%. Less water is used and hot water costs are reduced.

One Bradley serves 8 to 10 persons simultaneously with fresh, clean water. Foot-control protects hands from contagious faucet contacts and the self-flushing bowl prevents dirt collections.

Bradleys have been made for nearly 30 years. You can modernize with Bradleys now with full confidence of continued service in the years to come. BRADLEY WASHFOUNTAIN CO., 2371 West Michigan Street, Milwaukee 1, Wisconsin.

***Send for illustrated Catalog 4701***

**Distributed Through Plumbing Wholesalers**

**BRADLEY washfountains**


**102** **Electronic Speed Drive**—Mototrol, a packaged electronic adjustable speed drive for precise control of d-c motors operated from a-c sources is described and illustrated in Bulletin B-4112, 24 pages. In three sections, first tells how drive promotes efficiency and economy. Sketches accompany explanation of what drive is and does. Covers function of control station, current limiting, dynamic braking and safety features. Second part is devoted to construction, maintenance and servicing of drive. Third part gives technical and application data, discusses operation and speed regulation of drive and tells how to select right model. Technical data includes schematic diagram and table showing ratings and dimensions. Westinghouse Electric Corp.

**103** **Motor Starters**—Starters suitable for use with 2300 to 4600-v motor drives are described in a recent issue (Vol. 1, No. 23) of the manufacturer's four-page periodical bulletin. It stresses protection against short circuits afforded by these starters and contains photographs of several models. The Electric Controller & Manufacturing Co.

**104** **Electric Connectors**—A new line of solderless electric connectors is described and illustrated in this 36-page catalog. It contains tables showing comparative sizes of round conductors as well as current ratings of wires and cables, copper tubing and bars, indoor and outdoor switches. Prices of connectors are listed according to class and this listing is preceded by a pictorial index. Photos, diagrams, construction specifications and ordering information are included for each class of connectors. General Electric Co.

**105** **Transformer Buyers Guide**—An excellent technical manual on instrument transformers is this 80-page catalog, GEA-4626B. Contains descriptions, photographs and index of ratings and construction for indoor and outdoor potential transformers, indoor and outdoor current transformers, outdoor metering outfits and portable potential and current transformers, according to cycles. Dimensions, prices and shipping weights are included with listing of each type, as is reference to manufacturer's bulletin dealing with that type of transformer. Index of types shows voltage and frequencies. Also included are tables showing mechanical and thermal limits of current transformers. Book has firm covers and ring binding for long-time reference use. General Electric Co.

**106** **Motor Starter Bulletin**—A-c full voltage starters to meet requirements of any type of motor drive are covered in illustrated Bulletin 12B7132. Discusses across-the-line motor control, construction features and operating arrangements. Manual and magnetic across-the-line starters, combination and reversing starters and push-button control stations are described and illustrated. Photographs show open-type models and standard enclosures. Allis-Chalmers.

**107** **Bearing Lubrication Bulletin**—This four-page folder describes and illustrates by colored drawings a motor bearing construction feature which permits easy introduction of new lubricant and complete removal of devitalized sludge. Includes cut-away drawings of two types of motors equipped with such bearings. U. S. Electrical Motors Inc.

**108** **Battery Care**—In 36 pages this instruction manual covers the maintenance of rubber jar storage batteries—tells how to place them in service, operate them and make repairs. Included are easy-to-follow instructions on installing element in new jar, attaching intercell connectors, using hydrometer and thermoter and mixing acid. Available battery parts are listed and ordering information provided. Technical data includes charging charts. Gould Storage Battery Corp.

## CONSTRUCTION & LIGHTING

**109** **Precision Lighting**—Catalog 65B, 14 pp in color, covers Ajusco localized lighting units for machine and bench use. The bulletin: outlines advantages of good spot lighting; illustrates by means of drawings and photographs, the equipment, construction, and application to

specific locations; gives recommended installation practice for several types of brackets; and includes tables of dimensions and price lists of the various types. Adjustable Fixture Co.

**110 Roof Fastening Handbook**—Complete details of this new method of roof fastening are presented in this new handbook, "Top Speed Fastening." Excellent detailed drawings of the various fasteners along with descriptions of their advantages are followed by step-by-step photographs of roofing being secured by this "Top-Speed" method. This continues right up to the point where screw heads are coated with a plastic protective coating. Also well illustrated and described are methods of removing sheets, proper sheeting sequence, phantom views showing locations of screws in roofing, detailed drawings of end laps, ridges, gable ends, eave flashings, metal closures, mastic closures, various types of lap joints, etc. H. H. Robertson Co.

## PROPERTY MAINTENANCE

**111 Industrial Vacuum Cleaner**—Bulletin F-586, four pages, describes heavy-duty vacuum cleaners for industrial use. Discusses construction features of cleaner and advantages of use. Photos show model in use. Breuer Electric Mfg. Co.

**112 Floor Resurfacing**—Step-by-step directions for applying a heavy duty concrete floor resurfacer for patching and for large floor areas are given in an illustrated folder, four pages. Tells composition, uses and advantages of the resurfacer and approximate coverage. Related products of manufacturer are also listed. Flexrock Co.

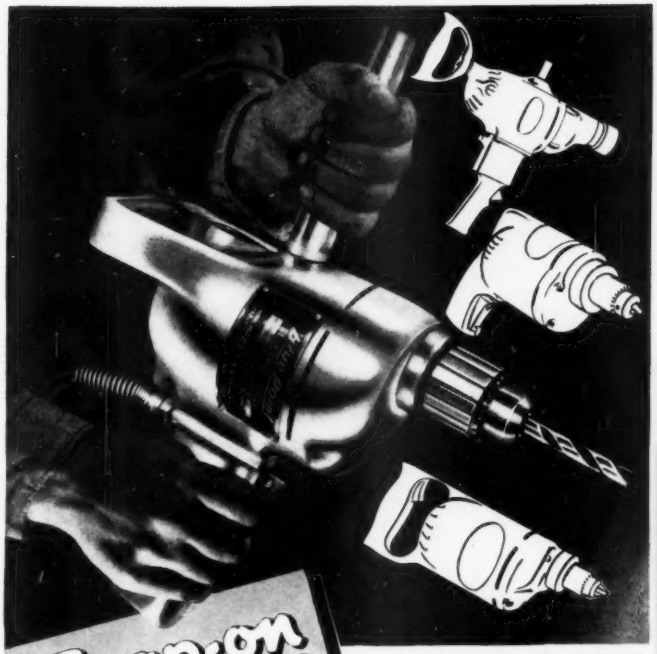
**113 Vacuum Cleaning Equipment**—Industrial applications of vacuum cleaning equipment are featured in a four-page folder. Photos taken inside plants show vacuum equipment recovering metal shot, removing lint from textile machinery and cleaning molds and screw conveyors. Also illustrated are a stationary system and light and heavy duty portable models. U. S. Hoffman Machinery Corp.

**114 Corrosion Resistant Paint**—An industrial surface coating that's resistant to acids and alkalis, water and oils, is described in this six-page bulletin accompanied by color chart. It lists solutions by which paint is not affected, tells ease of application and stresses economy of use. Photos show typical industrial applications where use of this paint has cut maintenance costs, and there's a graph showing one plant's savings over a 10-year period. Prufcoat Laboratories, Inc.

**115 Sweeping Machine**—How cleaning costs can be cut by use of mechanized sweeper are explained in a six-page illustrated folder. Gives specifications of machine, describes and illustrates attachments and replacement parts, applications, and conversion for use as lawn mower or snow plow. Photographs show machine in use. Includes comparison chart showing savings afforded by use of machine, letters from users and list of firms using sweeping machine. Indian Motor Cycle Co.

**116 Paint Color Selector**—Here's a full-color, attractively illustrated catalog showing how a plant engineer can help to increase production and decrease accidents and fatigue by planning a scientific color scheme. Contains a table listing desirable combinations for different exposures and a color wheel which can be revolved to show how these colors would look on ceiling, wall and dado. Two pages are devoted to discussion of the merits of this heavy-duty paint and there's a color chart of paint chips showing available shades, their composition and reflectancy percentages. American Marietta Co.

**117 Insulation Handbook**—Here's a 108-page technical manual of immediate practical value to plant engineers interested in year-round insulation because it includes summer as well as winter "U" values. Lists 12,852 certified FHA approved "U" values of various walls, floors and ceilings with all coefficients calculated in accordance with FHA procedure. Use of insulation with typical wall, floor and ceiling sections is compiled in tabular form and illustrated with drawings showing proper position of insulation to obtain stated "U" value. Authors say reason for inclusion of summer "U" values is

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1/4" 5/16" 3/8"
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**15 MODELS . . . A TYPE AND SIZE FOR EVERY JOB**

Whatever your drilling requirements — occasional small jobs — general intermittent operations or continuous heavy work — Snap-on can furnish the best drill to fit your purpose. Superior features include heavier and more powerful motors than many competitive tools of similar chuck capacity . . . extremely efficient cooling . . . helical gears throughout . . . all ball bearing construction permanently lubricated and sealed from dust and grit . . . heavy duty Jacobs chucks . . . extra long (15 feet) heavy 3-conductor cable treated to withstand oil, grease and wear. Shipments made promptly from Snap-on branch offices located in 40 key industrial cities . . . write for complete catalog.

*Blue-Point general purpose, straight shank, high speed drills available in fractional sizes from 1/16" to 1/2"; Wire Gauge Drills from No. 1 to No. 60.*

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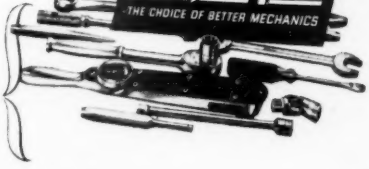

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*Offers These Important Advantages*

- Measures up to 1000 amps—up to 600 volts.
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- Thumb operated range selector switch.
- 7 ranges—5 current and 2 voltage.
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- Suitable for 50-70 cycles.

RANGES: 0-10 *amps*; 0-25 *amps*; 0-100 *amps*; 0-250 *amps*; 0-1000 *amps*; 0-150 *volts*; 0-600 *volts*.

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high efficiency of reflective insulation in checking flow of heat downward from roof. Qualified engineers may have this book free. Silvercote Products, Inc.

## MATERIALS HANDLING

**118 Brakemotor Bulletin**—Integral brakemotors, individually designed for powering specific equipment, are described in detail in this eight-page Bulletin B-501. Available sizes and ratings are listed and there's a table showing relationship of torque, brake size and applicable motor frame. Construction and operation are illustrated and discussed. Illustrations include photographs of various models, some of them showing industrial "start and stop" applications, as in bottling machinery, cranes and compression molding presses. Star Electric Motor Co.

**119 Lift Truck Appliance**—The "Load-Grab" lifting and carrying device, for use with manufacturer's 2000- and 4000-lb capacity lift trucks, is described in this eight-page illustrated booklet. Explains how hydraulic controlled lift with detachable power-driven arms carries boxes, bales, drums and other objects without use of pallets. Different types of arms are pictured and their application discussed. Includes answers to questions generally asked about this device and many photographs of it in use without and with conventional pallets. Hyster Co.

**120 Lifting Tong Catalog**—In 24 well-illustrated pages this catalog tells about the manufacturer's line of "Safe-T-Tong" for cranes and hoists. Gives background of company and product. Describes and illustrates construction and operation of tongs and discusses engineering services available for specific jobs. Includes a table showing types of tongs, dimensions, capacities, shipping weights and applications. Several pages of photographs show these tongs at work in various industrial jobs. Heppenstall Co.

**121 Traveling Cranes**—Sixteen-page Catalog No. 217 is devoted to the manufacturer's line of cranes, auxiliary hoists and component parts. Photographs of available equipment are accompanied by discussion of construction details and advantages. Also included are photos of cranes in use and there's a list of industries using this line. Tables show dimensions of cranes and standard operating speeds. Shaw-Box Crane Div. of Manning, Maxwell and Moore, Inc.

**122 Overhead Handling Equipment**—In Bulletin C-1, 56 pages, are more than 100 photographs of the manufacturer's overhead handling equipment in use in all types of industries. Sketches of trolleys, cranes, switches, track and auxiliary equipment show construction details, safety features and electrical advantages. This book also discusses engineering services offered and includes a data sheet for requesting information on special problems. The American Monorail Co.

**123 Electric Hoists**—Standard type hoists, controls and special limit switches are described and illustrated in Bulletin No. 838, 12 pages. It discusses safety features, accessibility of mechanical parts and other advantages of entire line and gives construction specifications in detail. Data charts on standard hoists, including lightweight models, are provided, as are photos of hoists in use. While this bulletin stresses standard construction, it also pictures special hoists custom-designed to meet particular conditions. The Euclid Crane & Hoist Co.

**124 Zipper Conveyors**—Bulletin 344, eight pages, is devoted to a description of a new zipper conveyor elevator, its construction, operation and applications. Sketches show how continuous zipper fastening on flexible belt permits bulky material to be enclosed within belt itself and carried in any direction on any plane. Other sketches show typical conveyor arrangements and there are photos of these conveyors in use. Also included are clear, concise answers to questions most frequently asked about zipper conveyor. Stephens-Adamson Manufacturing Co.

**125 Steel Winches**—Four-page bulletin, WI-99, describes, illustrates and quotes prices on a line of all steel winches in 5 and 2-ton capacity. Tells jobs for which

Announcing the **NEW** "Engineered" **PIPE WRENCH**

## fully engineered

- ★ Modern functional design—only four parts—provides ideal lightness, strength and safety.
- ★ Exceeds Federal specifications: Type II Heavy Duty—GGG-W-651a.
- ★ Light in the hand—streamlined for weight-saving—palm-fitting handle.
- ★ Tough on the job—Roxco metal handle for maximum strength.
- ★ Positive grip with quick release—simplified cushion action.
- ★ Drop forged alloy steel replaceable insert jaws—teeth hardened by localized induction heat process.

## fully guaranteed

against defects of material and workmanship

**ROXCO**

*Look for this name and Trimont Mfg. Co. on each wrench — your assurance of better, longer service.*

Here's the up-to-the-minute modern, fully engineered Heavy Duty Pipe Wrench that buyers and users have looked for. It's the new ROXCO — the advanced wrench design perfected and manufactured by the long experienced makers of TRIMO Tools. It is the ultimate result of new patterns and dies, new metallurgical formula — every part newly designed with modern engineering and crafting care to simplify and save weight while actually adding strength. We say — and you'll prove to your satisfaction — that the new ROXCO is a great addition to the famous Trimont line.

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**TRIMONT MANUFACTURING CO.**

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## Advanced

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Direct transfer of heat from the products of combustion to the air without an intermediary, utilizes every possible heat unit in the fuel, with the amazing results of 82-86% efficiency with No. 3 oil or gas.

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**THERMOBLOC 300**

300,000 b.t.u.'s, only 7' high, weight 800 lbs.

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550,000 b.t.u.'s, 10' high, 30" diameter, weight 1200 lbs.

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Manufacturers of the well-known Thermix Power Plant Equipment

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each is suited. Discusses and illustrates parts and construction features and includes price list for parts. David Round & Son.

**126 Light Duty Elevators**—Bulletin B720 (8440), eight pages, discusses economy ease of installation and uses of self supporting electric elevators specifically designed for hoisting light freight between two or three floors. Sketches illustrate construction features of all parts. Includes drawings showing typical installations and tables giving dimensions and capacities. Also lists cities where manufacturer has offices. Otis Elevator Co.

**127 Self-Propelled Cranes**—Sixteen-page bulletin (Form No. 1451518) illustrates wide application of self-propelled all-purpose cranes in industry and construction work. Discusses briefly their operational advantages and their use with different attachments. Devotes most of space to pictures showing cranes at work in yard service, excavating, road and building construction, ship building and dam construction. The Thew Shovel Co.

**128 Dumping Equipment Catalog**—Sixty-four page Catalog 247 covers hoisting and dumping equipment adaptable for mounting on any truck. Shows how one hoisting unit can be used with any number of detachable bodies and how different bodies can handle all types of loads. Gives specifications for hoisting units, regular and special bodies. Contains several pages of photographs showing equipment in use, handling trash, rock, scrap metals, hot materials. Includes dimensions and shipping weights of hoisting units and bodies, mounting data and drawing showing typical mounting. Also lists boom extension accessories and baling presses. Dempster Brothers, Inc.

**129 Crane Control Bulletin**—Magnetic crane controls for a-c cab operated cranes are described and illustrated in Bulletin 930, eight pages. Covers controllers for cranes with and without mechanical load brakes, bridge and trolley motions, and contra-torque hoist. Tells advantages of frequency relay performance. Illustrations show controllers and switches and industrial applications. Includes dimensions, graphs showing accuracy of operation, and performance curves. Electric Controller & Mfg. Co.

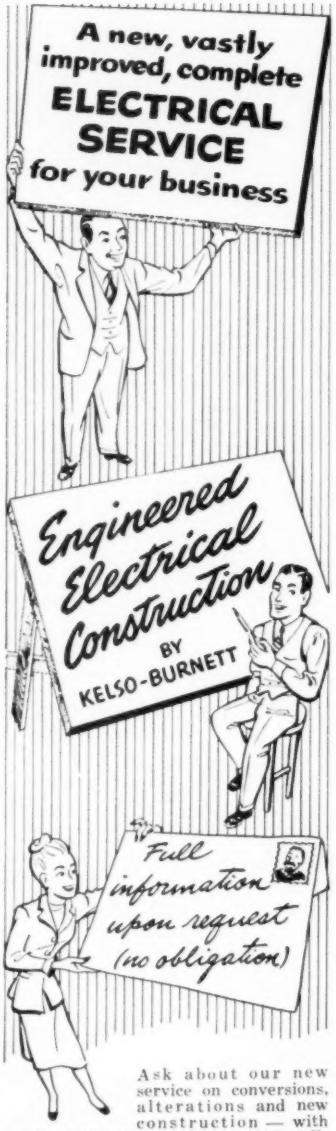
**130 Trolley Hoist Bulletin**—No. BH-49, four pages, describes and illustrates "beam hugger" trolley hoists requiring minimum of headroom. Discusses construction features and advantages. Includes dimensions and prices. David Round & Son.

**131 Belt Conveyor Bulletin**—Belt conveyors in three types are described and illustrated in Bulletin P.B.60-1 A-1, 12 pages. Discusses medium duty horizontal roller unit, medium duty incline roller bed cleated booster, and incline belt with automatic horizontal feed and discharge section. Also discusses power unit, idler or take-up units common to all types. Photos show industrial applications. Technical data includes specifications and typical layouts. Island Equipment Corp.

**132 Electric Hoists**—Bulletin RO-49, four pages, introduces new line of small, durable electric hoists of the hook and built-in-trolley types. Gives specifications, dimensions and prices. Illustrates and describes in detail reactor and motor brake, gear system, safety limit stops, hooks, chain guide and stripper and other parts. David Round & Son.

**133 Conveyor Planetary Bulletin**—Index 2195, four pages, describes and illustrates variable planetary control for belt conveyors which provides any speed up to 800 rpm at constant torque. Photos show principle of operation and applications. Explains how control provides any selected speed and is adaptable to quick changes. Includes diagram showing dimensions, table of load ratings. B. F. Goodrich.

**134 Conveyor Bulletin**—"Modern Time and Cost Savers" is title of 16-page illustrated Bulletin No. 62 on roller conveyors especially suitable for warehouses food industries, bottlers, canners and packers, grain mills and seed distributors. Covers gravity roller and wheel conveyors, supports, portable piling machines, horizontal loaders and unloaders and other units. Includes dimensions, specifications, and many photos of conveyors in use. Standard Conveyor Co.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**135 Truck Operators Guide**—A 30-page instruction manual, No. G.2, for operators of fork lift trucks, this book tells how to handle gears, clutch and brake, how to steer truck, and handle lifting equipment and accessories. Contains helpful hints on working in close quarters, entering railroad cars, picking up different kinds of loads. Discusses safety precautions and necessary maintenance. Illustrations include sketches showing parts, correct operating methods and good loading practices. Two pages are left blank for operator's own notes. Towmotor Corp.

**136 Dumping Equipment**—Catalog Supplement No. 8065, 16 pages, describes and illustrates hoisting unit and dumping bodies adaptable to all types of loads and mountable on any truck chassis. Contains many photographs of dumping bodies and their application as well as pictures illustrating how one hoist can use any number of dumping bodies. Pictures show this equipment handling dust, liquids, iron and even hot materials. Dempster Brothers, Inc.

**137 Truck Bulletin**—Four-page Bulletin No. 1439 describes and illustrates manufacturer's line of materials handling equipment, including fork lift trucks, platform trucks and industrial tractors. Contains photographs of different models and tables showing capacities, dimensions and construction specifications of models. The Buda Co.

**138 Overhead Handling Equipment**—Here's a collection of several bulletins—36 pages in all—covering manufacturer's system of overhead materials handling, bound together for easy reference. First bulletin: overhead system, its economy and applications. Other sections are devoted to detailed discussions of Trambeams and suspension fittings, runways and cranes, conductor bar electrification systems, carrier heads and wheel assemblies, and motor drives. Each subject is illustrated with photographs and diagrams showing dimensions and assemblies. Also included is table showing Trambeam spans and loadings. Whiting Corp.

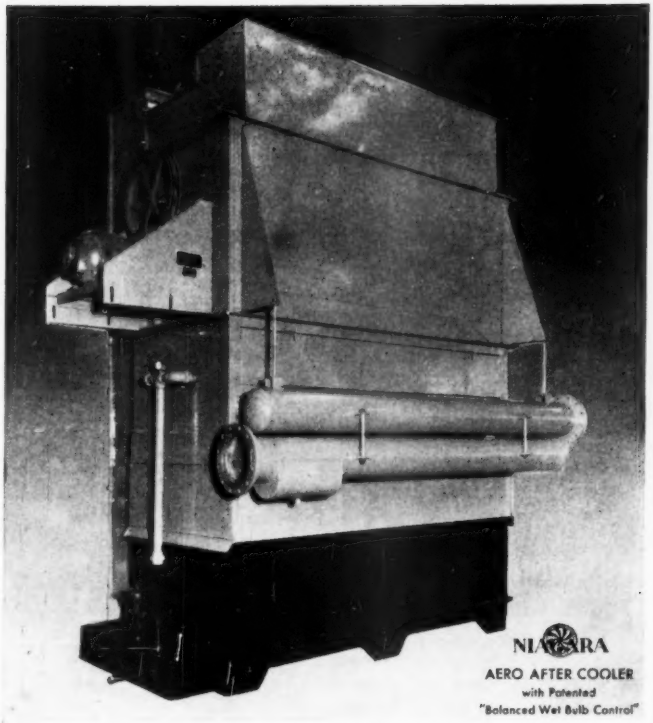
## INSTRUMENT AND CONTROLS

**139 Transformer Test Set**—Bulletin 55, eight pages, describes and illustrates a portable, direct-reading instrument for measuring turn ratio in transformers and checking polarity, tap changer defects, load division and circulating currents. Tells applications of instrument and simplicity of operation, safety features and grounding. Also explains of its hand-cranked A-C generator, low potential excitation and general construction. Refers to instruction manual furnished with set. James G. Biddle Co.

**140 Dynanometer Bulletin**—Inexpensive, direct-reading dynanometer for measuring traction, tension or weight up to 20,000 lb is described in four-page Bulletin D. Explains, operation, construction and advantages of instrument. Illustrations include photos of dynanometer in industrial use. One page is devoted to photos of different capacity models, showing division in pounds indicated on dials. Prices quoted. W. C. Dillon & Co., Inc.

**141 Thermometer Bulletin**—Stainless steel thermometers, for practically every industrial use, are described and illustrated in Bulletin T, 4 pages. Contains actual-size photographs of dials. Includes construction specifications, advantages and adaptations, as well as stem lengths and temperature ranges available and prices. Also lists special models, standard mounting units and additional equipment manufactured. W. C. Dillon & Co., Inc.

**142 Recording Instruments Data Book**—A new oxygen analyzer—based on the paramagnetic property of oxygen—is introduced by description and illustration in Bulletin 48-829, 16 pages. Tells advantages and applications of new instrument. Also treats in detail the manufacturer's long-established analyzer for carbon dioxide and other gases, as well as an electronic recorder (which records temperature and pressure, too) for use with the analyzers. Includes discussion of several recommended gas sampling systems. The Hays Corp.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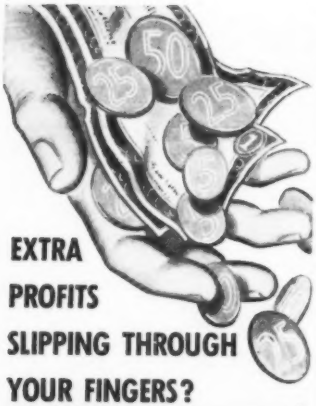

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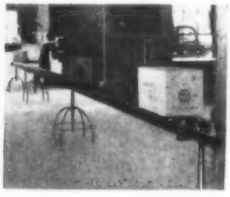

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## PUMPS

**143 Turbo Pump Bulletin**—Four-page illustrated folder deals with two popular types of high-speed, single stage turbo pumps. Lists typical services and boiler feed ratings. Detailed discussion of outstanding features is accompanied by cross-section drawings showing operating principles of pumps and governing gear. Also lists other types of pumps and control valve and outlines data need for inquiries. The J. S. Coffin, Jr., Co.

**144 Pump Bulletin**—No. 488, four pages, tells about controlled volume chemical pumps with rotary air or gas motor drives for pumping in small volume or at high pressures, or handling difficult or corrosive materials. Discusses motor feed systems, stroke adjustments and merits of special valve construction, illustrated by cut-away drawing. Technical information includes capacity pressure selection table and diagrams showing pump installation and automatic pH control system. Milton Roy Co.

**145 Proportioning Feed Pumps Manual**—Bulletin No. 1100, 16 pages, describes and illustrates the application of chemical feeding and proportioning pumps designed for use in almost every industry and available in standard and midget sizes for pressures up to 6000 psig. Contains photos of models and diagrams showing dimensions, sectional views and industrial applications. Also includes a capacity schedule table, photos and descriptions of available accessories and discussion of variations in construction to suit specific requirements. Typical boiler water conditioning systems are illustrated. Proportioneers, Inc.

**146 Oil Pump Bulletin**—Twelve-page Bulletin No. PM-48 presents engineering data on self-priming centrifugal pumps for petroleum and other volatile liquids. Discusses and illustrates construction features and advantages and gives general information on pump installation. Technical data includes selection charts and specification tables for engine-driven and electric motor-driven pumps, specific gravity and viscosity tables, and tables showing liquid head equivalents, maximum suction lifts at sea level atmospheric conditions, friction loss in liquid in steel pipe and fittings, and loss in pounds pressure per 100 ft of smooth bore rubber hose. Marlow Pumps.

**147 Multi-Stage Pumps**—Bulletin No. 48-4000, 16 pages, covers centrifugal, multi-stage, split case, volute type pumps for medium and high pressure service. Descriptions are illustrated by photos showing construction features and by sectional drawings. Includes table of dimensions, list of service applications of different models and photograph of an installation. Byron Jackson Co.

## TRAPS AND PIPING

**148 Steam Trap Manual**—"Solving Steam Trap Problems," 36 pages, is both a buyer's guide and reference manual, offering helpful information for anyone called upon to solve steam trap problems. Covers correct trapping practice for unit heaters, jacketed kettles, autoclaves, submerged surfaces, hospital, kitchen and laundry equipment, steam mains, header drips and other units. Tells how to select proper size and determine lift of trap. Explains theory, operation and maintenance and gives details of simplified piping for steam traps. Also discusses float traps, air release valves and pipe line strainers. Specifications, capacities and some prices are listed. Technical data includes condensate and steam tables. Generously illustrated with photos of traps and installations, sketches and diagrams showing construction and operation. The V. D. Anderson Co.

**149 Pipe Units**—Four-page illustrated folder, Form No. 4808, describes pre-fabricated pipe units insulated and weatherproofed for overhead lines. Photographs show how units are made and packed for shipment and installed for use. Includes three pages of diagrams showing dimensions, general construction and expansion loop and anchor details and suggested plans for pole support spacing. Ric-Wil Co.

**150 Steam Trap Catalog**—Bulletin No. 1200G, 32 pages, is a handy reference manual for any plant engineer using process


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Couplings

These users want not only a gear type coupling but also a WALDRON Gear Type. They recognize the WALDRON as the most advanced design of the gear type. From a standpoint of shaft size, horsepower, speed and service, comparison with ordinary type couplings make the choice easy. Careful buyers now specify WALDRON—for WALDRON means Gear Type and Gear Type means WALDRON.

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steam. Covers thermostatic and float-and-thermostatic traps for working pressures up to 150 psi, thermostatic traps for working pressures up to 15 psi, and dirt strainers, with illustrations showing inner construction features. Describes their use with unit heaters, sterilizing equipment, pasteurizers, cooking equipment and steam tables, laundry equipment, drying machinery, open tanks and heating equipment for ships. All applications clearly illustrated. Technical data includes tables showing capacities and ratings in pounds of water per hour, dimensions and ordering information, steam requirements of sterilizers and process equipment, heat transmission of pipes immersed in water, and unit steam consumption of kitchen appliances. Warren Webster & Co.

**151 Pipe Hanger Catalog**—Ninety-page Catalog 10-D is a valuable buyer's guide for adjustable pipe hangers and supports. Covers hangers for attachments to pipe and to structure, hanger assemblies, spring hangers, hanger rods, pipe supports and related equipment. Each type described and illustrated by photo and dimensional diagram and listed with dimensions and prices. Catalog also includes standard specifications, photos of installations and terms of sale. Indexed for quick reference; punched for filing in binder. Grinnell Co., Inc.

**152 Insulated Pipe Units**—Bulletin No. 4809, eight pages, describes and illustrates prefabricated pipe units suitable for overhead or underground distribution systems for steam, hot water, processing liquids, refrigerants and oils. Cut-away drawings and photographs show construction details and installation advantages. Includes table showing wrought iron and steel pipe sizes available. Also discusses economy of insulated piping. The Ric-Wil Co.

**153 Pipe Clamp Catalog**—No. 41-O, 28 pages, covers repair clamps and saddles, and valve and bibb reseaters for permanent repairs on steam, hot or cold water, gas, oil, ammonia or brine line. Each type of clamp is described and illustrated and accompanied by table of dimensions and prices. Catalog also lists gaskets and gasket materials. Includes photos showing how to apply clamps to pipes. M. B. Skinner Co.

**154 Welding Fittings**—Catalog No. 501 contains 12 pages of information on welding fittings produced from seamless steel tubes. Four pages are devoted to general description of fittings, illustrated by photos showing how they're made, tested and shipped, and their advantages. Also includes dimensions of pipe, dimensional tolerances for seamless steel butt welding fittings and sketch showing welding bevel standards. Each of other pages covers a particular fitting, its dimensions, shipping weights and prices. All pages ring bound in cardboard binder with space for additional sheets. Globe Steel Tubes Co.

**155 Welding Stud Prices**—Dimensions and prices on a new line of standard studs, designed for end welding with manufacturer's automatic welding gun and immediately available for shipment, are quoted in a four-page illustrated folder. Includes ordering information, photographs of special purpose studs, and a list of manufacturer's district offices and distributors. Nelson Stud Welding Div., Morton Gregory Corp.

## TREATMENTS

**156 Corrosion Preventive**—Bulletin 1540, four pages, describes a corrosion-resistant protective coating for cold, wet steel surfaces and discusses its uses on water storage tanks, refrigerant condensers, air conditioning equipment and equipment aboard ship. Tells how to order coating and how to apply it and illustrates, by photos, available application equipment. The Dampney Co. of America.

**157 Water Conditioning Bulletin**—This is an eight-page discussion of water and chemicals developed for conditioning it to control scale and algae and inhibit corrosion. Describes several chemicals in detail, giving properties, composition and application. Also discusses special purpose chemicals. Wright Chemical Corp.

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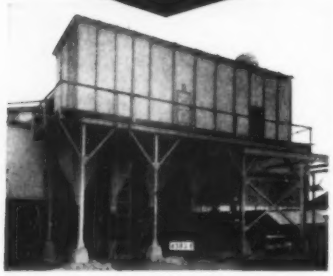

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**158 Application Data Bulletin**—Titled "The Aroclors," chlorinated biphenyl and chlorinated poly-phenyls, this booklet describes the unique properties which enables this material to fulfill certain requirements. The Aroclors have won a place in the electrical insulating field and in such widely differing applications as non-flammable hydraulic media, high-temperature and high-pressure lubricants, heat-transfer and expansion media, sealing compounds, adhesives and protective coatings, including plastics, pigments, lacquers, paints and varnishes. This booklet contains 28 pages and presents the combined information gathered by the company from what it believes it to be reliable and dependable sources. Monsanto Chemical Company.

**159 Chemical Proportioning Literature**—This four-page catalog lists 37 available bulletins and reprints of articles puclished by manufacturer on general subject of constant rate and flow responsive chemical proportioning. Material listed covers equipment, methods and applications. Proportioneers, Inc.

**160 Chlorinator Catalog**—Dry vacuum chlorine dispensing units for purifying drinking water supplies, for treatment of sewage and for treatment of condenser water in industrial and power plants are described and illustrated in 16-page Catalog Section 61. Tells advantages of unit, discusses assembling and mounting, recording instruments and automatic proportioning. Chlorine filter pressure gauge, chlorine flow measurement and adjustment, vacuum regulator and water check and method of operation are described in detail and illustrated. Also described is dry gas feed type of dispenser. Includes capacities, dimensions and diagrammatic layouts. Fischer & Porter Co.

## SAFETY, SANITATION

**161 Dermatitis Prevention**—Bulletin 222, a small folder, discusses prevention of industrial dermatitis by the use of specially prepared hand cleanser obtainable only from manufacturer. Stresses economy of prevention in terms of money and man hours. Lists prominent industrial users of product. L. E. Hicks & Son, Inc.

**162 Gas Signal**—A new safety appliance which flashes a red light in the presence of dangerous concentrations of combustible gas is described and illustrated in a two-page bulletin, No. DT-4. Tells advantages and industrial applications. Lists manufacturer's other safety appliances. Mine Safety Appliances Co.

**163 Toilet Compartments**—Catalog 86, 20 pages, is claimed to be first catalog on toilet compartments to contain color chart with paint chips showing available shades. Descriptions of overhead braced, ceiling hung, floor supported, flush and panel-type compartments are accompanied by drawings showing construction details, dimensions and specifications and full-color pictures of models. Also lists hospital cubicles, shower stalls and dressing room compartments. Includes plans for toilet and shower room installations. Sanymetal Products, Inc.

## PROCESS HTG., DRYING

**164 Draining System Bulletin**—Draining and air venting of paper machine cylinders are treated in eight-page Technical Bulletin No. 3. Discusses requirements of an efficient method of draining and air venting dryer rolls and tells how manufacturer's system meets these requirements. Sketches and diagrams show unit and installations. Sarco Co., Inc.

**165 Air Dryer Bulletin**—Four-page Bulletin 1500 tells of protection, economy and increased efficiency afforded by air drying units "wherever compressed air or gas is used." Open frame and cabinet models are illustrated, simplicity of operation stressed and capacities listed. Inserted in folder is an inquiry data sheet to facilitate writing for specific information. Dehydraire Division of Davis Engineering Co.

**166 Steam Drying Efficiency**—How to Increase the Output of Your Dry Cans" is the title of an eight-page technical bulletin, No. 2, written particularly for the textile industry. Describes and illustrates by sketches ways of increasing efficiency


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of dry cans. Treats such subjects as mechanical drying by steam, suction dryers, costs, causes of inefficiency. Discusses in detail the manufacturer's system of draining and air venting. Lists information desired by manufacturers for orders. Sarco Co., Inc.

**167 Automatic Defrosting System**—Complete details of a hot gas "slug eliminator" defrosting system are given in a four-page, four-color bulletin, No. DF-100. Simplified diagrams in several colors show operation at various stages in the defrosting cycle of a two-evaporator refrigeration system, and a description of the operating principle accompanies the diagrams. Bulletin also discusses installation of slug eliminator in existing refrigeration systems and tells of specialized services offered by company's engineering department. The Patterson-Kelly Co., Inc.

## BOILERS, HEATING

**168 Giant Unit Heaters** — Twenty-four page catalog, No. WN-28-2, describes blower-type giant unit heaters for industrial heating and ventilating. Discusses performance of standard, thermajust and valve controlled types, construction details of parts, operation, selection and applications. Technical data includes diagrams and dimensions of different types of heaters and tables showing basic ratings, capacities and external resistance and Btu conversion. Also includes control and piping diagrams, typical specifications and guarantee. John J. Nesbitt, Inc., Warren Webster & Co.

**169 Packaged Steam Generator** — Illustrated Bulletin FC75, four pages, introduces a new, completely automatic steam generator with guaranteed 80 per cent over-all operating efficiency. Explains how generator requires less space and produces more steam, and discusses burner, draft fan, controls, gas burner assembly and gas-oil conversion. Includes table of dimensions and capacities and lists construction features of manufacturer's entire line of generators. The C. H. Dutton Co.

**170 Automatic Oil Burner**—Bulletin 400, four pages, describes automatic burner shipped as complete factory-built unit, ready for service connections on oil burning system for all types of boilers and furnaces from 100 developed hp. Explains economy, dependability and ease of installation of this compact burner. Description of construction is illustrated by front and side views of photos, showing control cabinet and accessibility of parts. Lists specifications of both fully-automatic and semi-automatic types. Also includes pictures of manufacturer's other equipment. Peabody Manufacturing Corp.

## MISCELLANEOUS

**171 Adhesive Reference Manual**—This 16 page illustrated manual covers sealers, surface coatings, cements, mastics, emulsions and other adhesives for wide industrial and marine application. Contains detailed discussion of viscosity, coverage, flammability, heat flow and resistance to acids and alkalis. For quick reference there's a chart summarizing bonding and drying times, colors, temperature limits, types of thinner indicated and other pertinent information about each adhesive. Manual is punched for permanent use in ring binder and includes additional data sheets on adhesives not covered in the manual itself which may be filed with it. Sketches and photographs show product in use. Benjamin Foster Co.

**172 Silicone Rubber** — Factual information about Silicone Rubber is presented in a 24-page catalog. Discusses development of this new synthetic, its chemical and electrical properties, resistance to heat and cold and suitability for use with solvents. Description of individual products are accompanied by photos of product itself and industrial application. Book also includes property tables for quick reference and ordering information and tells technical services offered. General Electric Co.

**173 Soldering Manual**—"Solder and Soldering Technique" is the title of a 28-page technical manual devoted largely to the use of soft solder alloys and soldering fluxes. Solder wire, preforms and related

The modern Troy-Engberg Steam Engine is designed to extract the power from the steam you produce before it passes, with little loss in heating value, into your heating or processing cycles. The steam engine acts as a reducing valve but it's a reducing valve that generates power or drives equipment and then exhausts most of the heat units into your processing or heating lines.

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Both fuse and refill engineered to withstand sudden inrush currents

★ REFILLED IN 7 SECONDS
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★ FUSE-WITHIN-A-FUSE
Construction retains all blowout soot in refill which is thrown away.

Write for bulletin telling whole story of STAR Fuse safety and economy.

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products are discussed and technical services offered by manufacturer are listed. Tables showing melting points of common solder alloys and length in feet per pound of solid wire solder are included. Kester Solder Co.

**174 Coolant Filter Catalog**—Sixteen-page catalog covers everything from selection to maintenance of localized filtering machine for keeping cutting fluids clean. Describes and illustrates available units and mountings, giving dimensions, prices and industrial applications. Selection guide shows recommended sizes for use with various models of grinding machines. Installation recommendations are discussed in detail, as are operation and maintenance. Sectional drawings show how filtering machine works. The Fostoria Pressed Steel Corp.

**175 Power File Catalog**—Valuable information on the selection and care of rotary power files and burs is compiled in this 24-page catalog. Covers hand cut, rotary ground and carbide burs. Each listing is clearly illustrated to show shape and flute details and includes sizes and prices. Also listed are file and bur assortments. Technical data includes table of approximate speeds and table identifying diameter of file or bur and length of cut. Nicholson File Co.

**176 Precipitator Bulletin**—An electronic precipitator, claimed to remove 90 per cent of airborne dirt, is described in this eight page bulletin. Explains and illustrates principle of operation and discusses flexibility of its unit construction. Contains photos of ionizer, collector cell and power supply and a cut-away picture of complete unit. A material list in tabular form facilitates selection of correct model for individual needs. Raytherm Manufacturing Co.

**177 Electrostatic Precipitator**—Four page folder describes electrostatic precipitator for nuisance elimination, smoke abatement or recovery of valuable products. Explains operation, tells advantages and gives performance records. Illustrations include photos of packaged power units and typical precipitator installations. Koppers Co., Inc.

**178 Cement Improver Bulletin**—Four-page folder discusses Portite, a "neutral compound in aqueous solution" with wide applications as cement improver. Tells how Portite used with cement promotes controlled air entrainment, reduces water requirement and promotes drying. Also discusses other advantages and includes photographs showing industrial uses of Portite improved cement. Hopper Products, Inc.

## Ball Bearing Pointers

THIS WRITER has had experience with ball bearings in for nearly fifty years but he now confesses that he is becoming amazed at the remarkable performance of modern types. When first introduced—on bicycles—ball bearings were considered a "delicacy," and they *were* rather delicate. But today they run on and on, under most severe conditions.

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Ball bearings should not be allowed to become too hot, but don't be alarmed if they become warm. Sometimes the grease itself is the cause of the warmth. Thus when a ball bearing starts up the grease is cold and it takes time to warm up the bearing sufficiently to thin the grease enough to be expelled from the contact and rotating parts.

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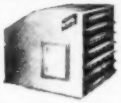
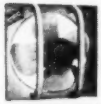


**PH**—Roof Ventilator complete weather-tight unit for factories, mills. Belt drive. Sizes 24 to 60 inches.



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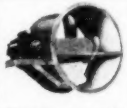

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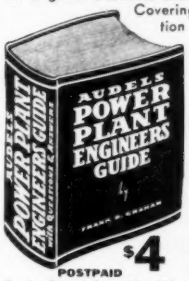


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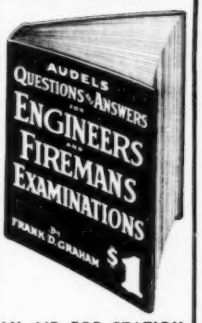


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### Chlorine Handling and Unloading

**Chlorine. Size, 72 pages, 8½ by 11 in; bound in heavy cover with plastic binding; well illustrated. May be obtained from companies listed below by writing, on company letterhead, to Columbia Chemical Div., Pittsburgh Plate Glass Co., 5th Ave. at Bellefield, Pittsburgh 13, Pa., or to Southern Alkali Corp., same address.**

THE MOST interesting and useful section of this book, to the average plant engineer, is the section which deals with Methods of Handling and Unloading. Covered here are: Safety Precautions and Emergency Measures; Shipping Equipment; Handling and storage of Cylinders and Ton Tanks; Unloading of Equipment; Returning Equipment and Materials of Construction.

Another chapter of considerable value is the Technical Data Section, Properties of chlorine, technical charts and tables, preparation of soda bleach liquors, preparation of lime bleach liquors, analyses of bleach liquors; temperature conversion tables, and conversion factors are presented in this section. The entire book is interesting, if only from an academic point of view; it is well illustrated and presents the story of this versatile chemical in an absorbing, non-technical manner.

### Industrial Control Techniques*

**Production Control by Lawrence L. Bethel, Walter L. Tann, Franklin S. Atwater and Edward E. Rung; size 6 by 9 in.; 237 pages plus appendices; illustrated; Second Edition; copyright 1948. Published by McGraw-Hill Book Co. Price $5.00. $3.50.**

THE FIRST Edition of this book was developed in the early year of the war for use as a textbook in special classes for war production workers. The Second Edition is an extensive revision, primarily in terms of the current concept of production control in industrial organizations, and secondly, to meet the needs of colleges where management engineering is assuming increased importance.

The general method of presentation has been first, a statement of basic principles; second, an illustration of these principles through specific industrial situations; and third, case studies from industrial experience. The book is well illustrated with forms and illustrations taken from practice.

The book is particularly interesting in that it deals primarily with production control. The interrelation of this with other departments is considered for clarity of interpretation and thus gives a broad view of industrial operations.

From the plant engineer's standpoint, probably the most valuable chapters are those applicable to spare parts and maintenance stores, dealing with scheduling and control of materials, receiving room procedure, checking, bin-tag procedure, storage records, etc.

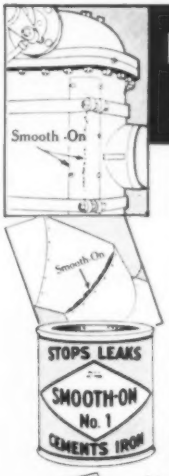
Appendix C is a detailed case study of a typical job-order production-control system, applicable at a maintenance and repair operation of a large number of industrial plants.

### Heat Engines *

**Theory and Practice of Heat Engines by Virgil Moring Faires. Size, 6 by 9 in.; 388 pp.; 251 illustrations; 8 tables; cloth bound. Published by The Macmillan Co. Price $5.00.**

To meet the needs of a short course in heat power and to implant knowledge of the application of the law of consideration of energy, the general energy equation is set up and applied over and over again.

*(Continued on page 70)*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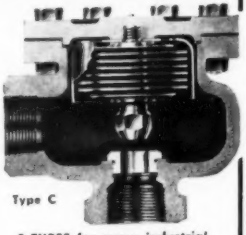


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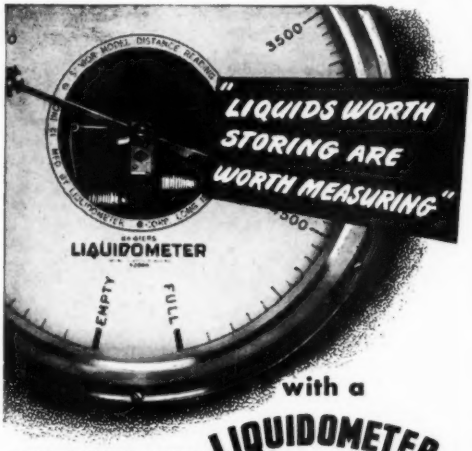


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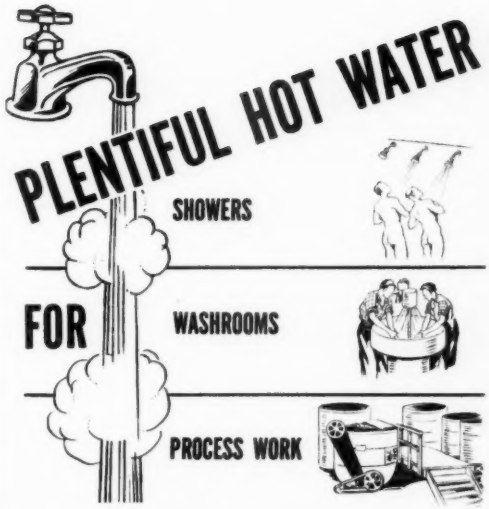


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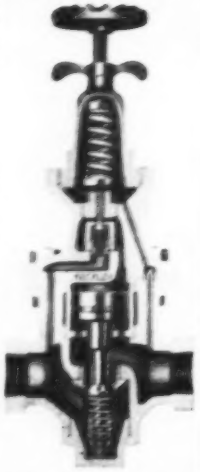

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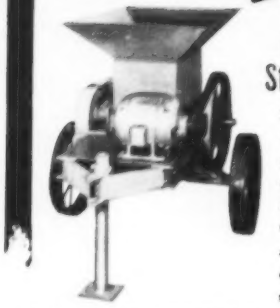

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Material from the author's previous book on Applied Thermodynamics has been used, but this book represents an independent appraisal of the theoretical developments different from the usual book on heat engines.

Introductory chapters deal with equations of a perfect gas; forms of energy; heat, work and internal energy; and thermodynamics process. The author then discusses compressors; internal combustion engines; steam turbines; reciprocating engines; steam generators; auxiliaries and combustion. The final chapter covers refrigeration.

## Concrete Inspection and Uses

CONCRETE PRODUCTION AND CONTROL—TVA Projects. Size 6 by 9 in.; 350 pages; cloth bound. TVA Technical Report No. 11. Published by the Superintendent of Documents, Washington, D. C. Price $1.50.

THIS VOLUME is a record of the more important facts concerning concrete use and control achieved in the construction of the structures built as a part of the general program of the TVA. The first 60 pages deal with the preliminary investigations and the production of concrete material. The next 100 pages deal with concrete design, production, placing, mixing and temperature control. This is a highly practical record of on-the-job practice. The next 60 pages deals with special tests and studies on such matters as slag aggregates, volume changes, hardening rates, flexture tests, sand-blanket construction joint treatment, tests on absorptive form liner, time for form stripping, effect of freezing and low temperatures, spoiling, etc.

From the plant engineer's standpoint probably the most valuable section is the 100 odd pages in the appendix. These cover cement specifications and instructions to concrete inspectors, report forms, laboratory equipment used, sampling methods and correlation of data from different projects. The book has a total of 229 well selected illustrations.

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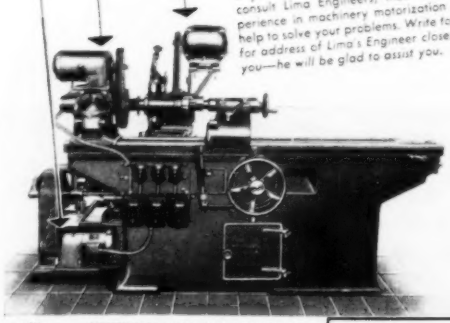

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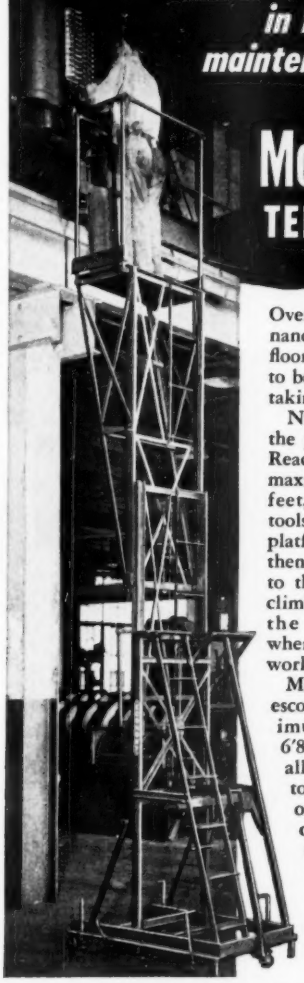

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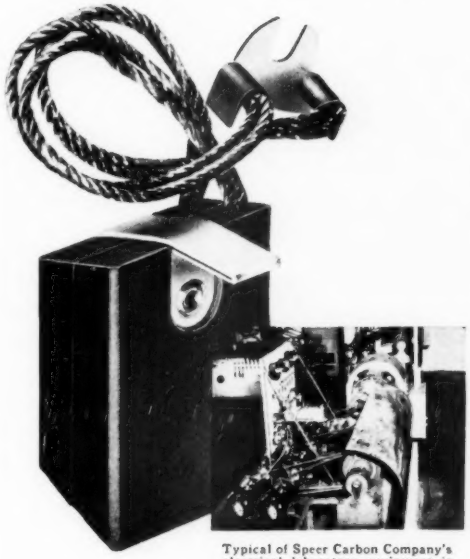
# Speer carbon brushes REFLECT of research years



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## Practical Applied Mathematics*

**Mathematics at Work by Holbrook L. Horton. Size 6 by 9 in.; 728 pp, including 145 pp of standard mathematical tables with logarithmic and trigonometric tables; illustrated with 196 drawings and diagrams; first edition, 1949. Published by The Industrial Press. Price $6.00.**

Practical application of arithmetic, algebra, geometry, trigonometry and logarithms in step-by-step solutions of typical mechanical problems. It is a thoroughly practical manual which came into being as the result of inquiries received by the editors of Machinery and Machinery Handbook for assistance in solving specific problems which were basically mathematical and related to mechanical work.

Each problem is presented to show: The problem; how to analyze it; develop a method of attack with the formula required; and the step-by-step procedure for working the example.

Classifications of the problem worked in the book is according to common mathematical principle, making it easy to find a general type of problem at hand or one closely paralleling it. The first five chapters deal with basic mechanical problems.

**An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.**

## For Electricians*

**Electricians' Pocket Companion by Benjamin Goldberg. First Edition; 5 by 7¼; 441 pages; illustrated; cloth; 1948. Published by Murray Hill Books, Inc. Price $2.50.**

In this handy-sized book for pocket or tool kit are hundreds of the facts, figures and methods needed constantly by the practical electrician. Covering the entire range of electrical subjects from motors, meters, and transformers to lighting, wiring, domestic heating systems and many others, this book brings together a wealth of information on code requirements, electrical circuit fundamentals, safety cautions, tools and time-saving work methods.

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## Better Motor Maintenance*

**Electric Motor Maintenance by W. W. McCullough. Size 5½ by 8¼ in.; 120 pages, illustrated. Published by John Wiley & Sons, Inc. Price $2.00.**

A HIGHLY practical book or manual by a service engineer of long experience in the manufacturing and repair department of Westinghouse Electric Corp.

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While the book is written in concise, clear, sometimes elementary language, it is not a step-by-step guide for the apprentice or inexperienced worker. Rather it is a broad but complete treatise on motor maintenance, well adapted to the use of supervisors or inspectors as a working outline of points that must be considered in the use, application and repair of motor equipment if good performance is to be expected.


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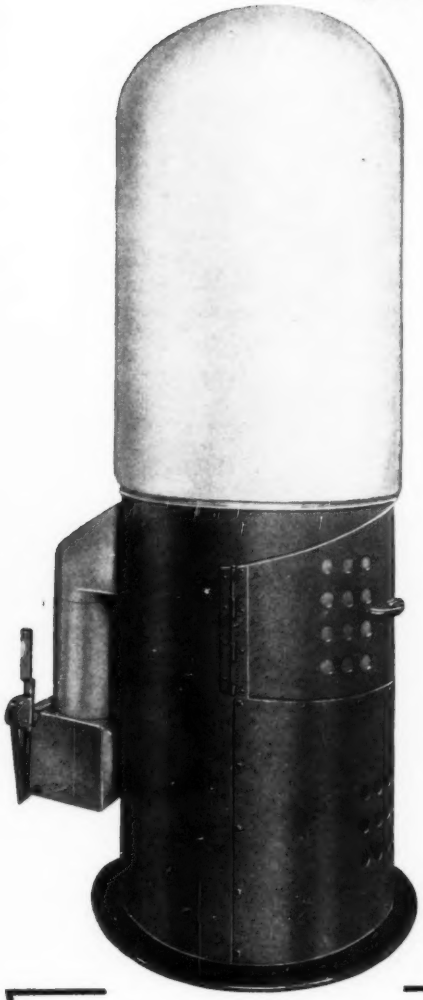

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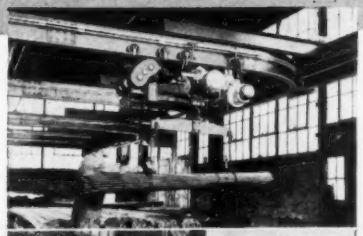

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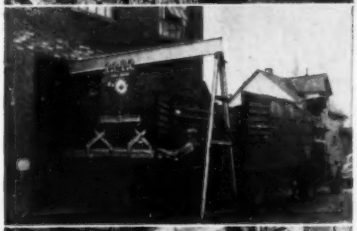

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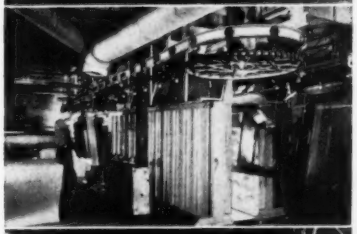

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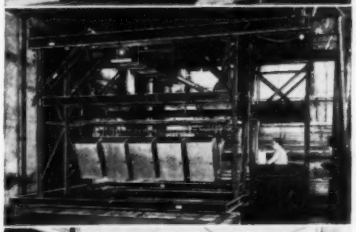

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